MICHIGAN

FOREST PEST DETECTION PROGRAM

REPORT FOR 1956

●

COMPILED BY

FORESTRY DIVISION,
MICHIGAN DEPARTMENT OF CONSERVATION

●

COOPERATORS

DIVISION OF FOREST INSECT RESEARCH, LAKE STATES FOREST EXPERIMENT STATION

DIVISION OF PLANT INDUSTRY, STATE DEPARTMENT OF AGRICULTURE

DEPARTMENTS OF ENTOMOLOGY, BOTANY AND PLANT PATHOLOGY,
FORESTRY EXTENSION SERVICE, MICHIGAN STATE UNIVERSITY

SCHOOL OF NATURAL RESOURCES, UNIVERSITY OF MICHIGAN

UNITED STATES FOREST SERVICE

PRIVATE FOREST INDUSTRY

INTRODUCTION

The Michigan Forest Pest Detection Program functions through the cooperation of many individuals, public agencies and private companies. Greatly increased interest in the problems of forest insects and diseases in the past few years, coupled with a reasonable and coordinated approach, have kept the program moving forward on an even keel to a point where it is making an increasingly valuable contribution to the welfare of the forests of the state.

Cooperation with neighboring states in regional activities is an important part of the program. The sixth Annual Lakes States Forest Insect Survey Conference was held in Minneapolis in February with representatives of federal, state and private agencies participating. The major problem confronting this group is the standardization and coordination of survey techniques and activities in Minnesota, Wisconsin and Michigan. To this end, standardized survey techniques have been approved for the spruce budworm, larch sawfly, forest tent caterpillar, jack pine budworm, pine tortoise scale, and the red-headed pine sawfly. These survey techniques were published in the U. S. D. A. Cooperative Economic Insect Reports during 1956.

Close coordination between corresponding agencies in the Great Lakes region has been possible through the formation of the Central International Forest Insect and Disease Conference. At this conference, entomologists, pathologists and foresters from the three Lake States and adjoining Canadian Provinces are able to discuss mutual forest pest problems and present research findings. The fourth meeting of this conference was held in October at Maple, Ontario.

On December 11 the annual meeting of the Michigan Forest Pest Detection Program committee was held in Lansing to review the work carried on during the year by the various agencies concerned with surveys, control and research; to discuss the annual report, and to make plans for 1957, particularly in regard to possible control projects. Those in attendance were: U. M. Martilla, A. F. Monroe, B. G. Buell, J. K. Kroeber, W. F. Morofsky, C. A. Boyer, J. B. Cody, S. A. Graham, H. J. MacAloney, A. T. Drooz, W. S. Cath, W. J. Young, P. R. Flink, G. S. McIntire, and N. F. Smith.

The following report of the activities of the Michigan Forest Pest Detection Program during 1956 was prepared by the Forestry Division of the Michigan Department of Conservation.

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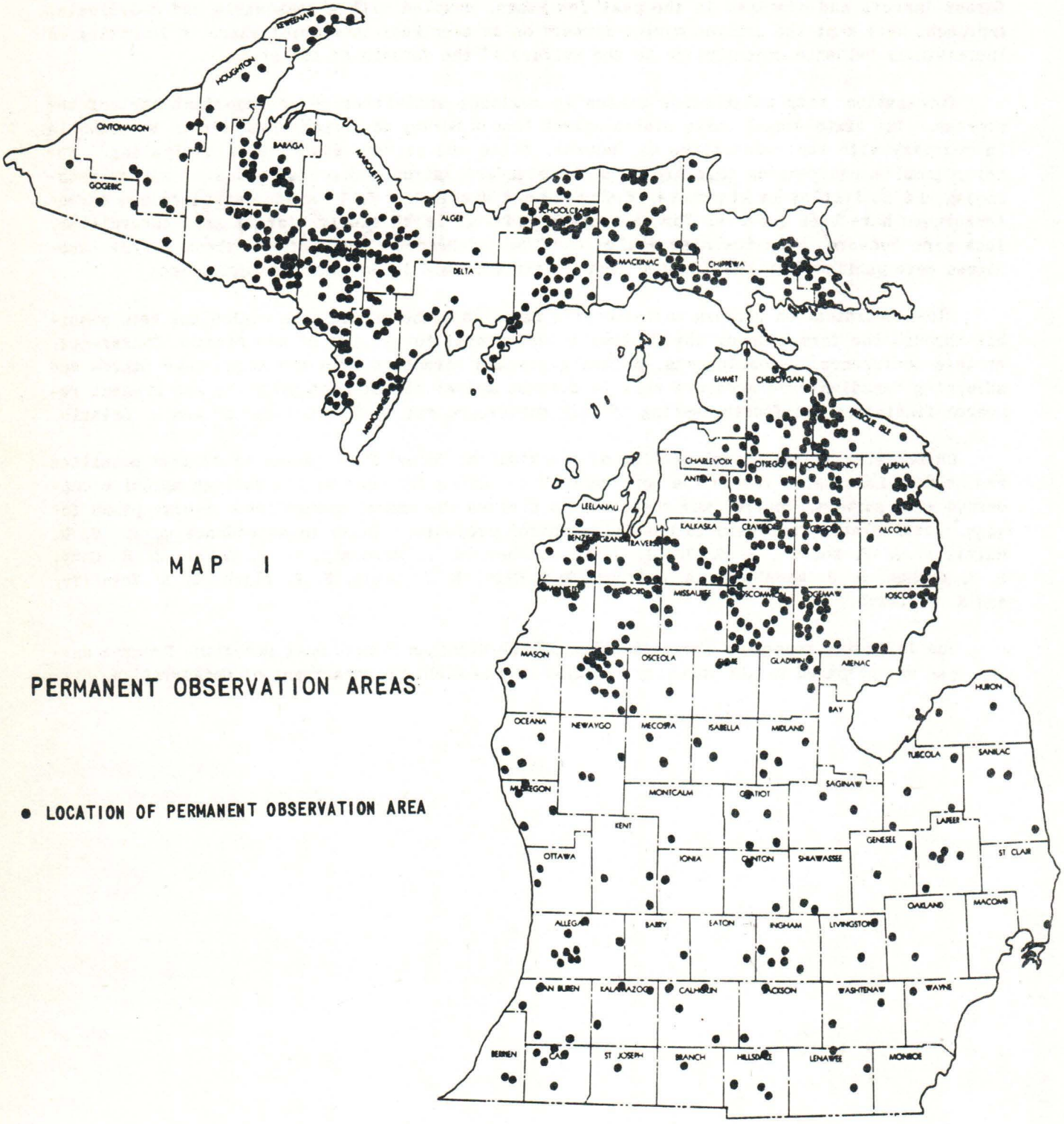


MAP 1

PERMANENT OBSERVATION AREAS

● LOCATION OF PERMANENT OBSERVATION AREA

ORGANIZATION OF PROGRAM

During the winter and spring of 1950 a forest pest detection program for Michigan was outlined and organized by the Conservation Department with the cooperation of the U. S. Bureau of Entomology and Plant Quarantine (now the Division of Forest Insect Research, U. S. Forest Service), the U. S. Forest Service, the University of Michigan, Michigan State University, and the State Department of Agriculture. The objectives of the program are: (1) to detect the presence of forest insects and diseases, and to apprehend outbreaks by systematically and annually collecting records of occurrence and damage; (2) to facilitate and organize direct control in case of emergency; and (3) to provide a basis for protective measures by indirect means.

The detection framework is built principally around the field organizations of the Forestry Division of the Conservation Department, which handles state and private lands, and the U. S. Forest Service which handles federal lands. The two educational institutions participate in training programs and act in an advisory capacity on insect and disease identification and control measures, as does also the Division of Forest Insect Research of the U. S. Forest Service.

The State Department of Agriculture, through its Division of Plant Industry, is directly concerned in the program by virtue of its statutory authority to establish quarantines, to enter on private lands for purposes of inspection, and, where necessary, to compel or provide for the control of serious insect pests and contagious plant diseases.

GENERAL PLAN

Since the detection program was added onto the already full work loads of existing field personnel, the necessity for keeping the job as simple as possible was the foremost consideration in the preparation of plans. A report form (See Appendix) was prepared and a list of 10 insects, considered to be critical at the time, was drawn up. Both the report form and the list of critical insects have been revised as the need arose. The report form has been set up with numbered items for checking so that information can be punched on cards and mechanically sorted for analysis. Data thus collected will, over a period of years, show definite trends and provide valuable information on insect populations and damage.

The general field plan, insofar as the State Forestry Division districts are concerned, calls for the establishment of permanent observation areas scattered throughout each forest district on both state and private lands in timber stands where critical insects exist or are likely to appear. (See Map I). Observation reports are submitted annually to the Lansing office of the division, indicating the degree of infestation, or the absence, of each of the critical insects on the designated plots. Those critical insects found only in the southern part of the state are not reported on in the northern regions, and vice versa. Thus, each district forester has only six to eight critical insects to observe.

In addition to observations for the critical insects the foresters are urged to collect and report any other insects suspected of being potentially dangerous or about which they are merely curious. Reported outbreaks which appear to warrant further investigations are followed up with field checking by the Division forest entomologist.

Each forester is provided with a supply of metal-capped mailing tubes for submitting samples for identification or confirmation. Samples collected on state forest and farm forest districts are sent to the Forestry Division offices in Lansing. Assistance on identification is readily available at the Entomology Department, Michigan State University, in East Lansing.

Specific requests for observation reports on the critical insects are made from the Forestry Division office throughout the season. Such requests indicate the insect to be reported on, review its identification, and specify the period during which the observations should be made. Special requests for reports on insects not on the critical list are likewise made in this manner.

The disease phase of the program does not follow the same routine as applied to insects, since there are relatively few "critical" forest diseases requiring constant surveillance. Individual programs have been developed for the important diseases with various state and federal agencies cooperating in survey and control work.

* * *

PROGRAM ACTIVITIES

PEST INFORMATION SHEET

During the spring of 1956, the Conservation Department prepared and distributed forest pest information leaflets on white pine weevil, European pine sawfly, European pine shoot moth, Saratoga spittlebug, and red-headed pine sawfly. (See Appendix for copies of these leaflets.)

The leaflets were prepared to fill a growing need, emphasized by the Lower Peninsula Forest Research Council, for a simple, inexpensive, hand-out sheet. These leaflets can readily be changed as control recommendations or other information changes, and contain information approved by the agencies cooperating in the Pest Detection Program.

The leaflets will provide cooperators with a ready reference for life cycle, insect and injury descriptions, and control information. In addition, they are available for distribution to plantation owners, tree farmers and others.

As of January 1, 1957, approximately 3,000 copies each of leaflets 1, 2 and 3, and 2,000 copies each of leaflets 4 and 5 were distributed to district foresters, county agricultural agents, Soil Conservation Service, vocational agricultural teachers, U. S. Forest Service, industry and other cooperators. The largest numbers were requested by the county agricultural agents.

Leaflets on the following insects are being prepared and should be ready for distribution by the next field season: forest tent caterpillar, spruce budworm, pine budworm, spruce gall aphid, pine tortoise scale, larch sawfly, anomala beetle, and red spiders or mites.

MIDSUMMER REPORT

A special report was distributed in late July summarizing, insofar as possible, the forest insect situation in Michigan during the early summer. This report was designed to help keep the men in the field posted on the status of the critical insects and aware of potential pests that should be watched for.

TRAINING SESSIONS

During the latter part of July, training sessions on the pest detection program and forest insects were held in the following places:

July 17 - Houghton.....Attendance, 45 (including 25 students)
July 18 - Gwinn.....Attendance, 11
July 19 - Escanaba.....Attendance, 8
July 24 - Gaylord.....Attendance, 23

Total Attendance, 87

The foresters attending represented the U. S. Forest Service, Michigan College of Mining and Technology faculty and students; private industry; Gogebic County, Michigan Highway Department; and the Michigan Conservation Department.

The training sessions were designed primarily to help the newer Conservation Department Foresters and cooperators become more familiar with the pest detection program, to review forest insects, and give them an opportunity to ask questions. The major forest insects in each area were shown by use of slides, specimen mounts, and a field trip. In addition, insects of lesser importance and those that might be expected to be found in the areas were also discussed.

Comments received indicated that the training sessions were of value to the men in enabling them to more accurately report on insect conditions, to be better qualified to answer questions they are asked, and to better judge the potentialities of insect infestations.

OTHER TRAINING MEETINGS

At the request of the Soil Conservation Service, two training sessions were participated in to help acquaint the field men with the harmful pests in their regions and the methods of control.

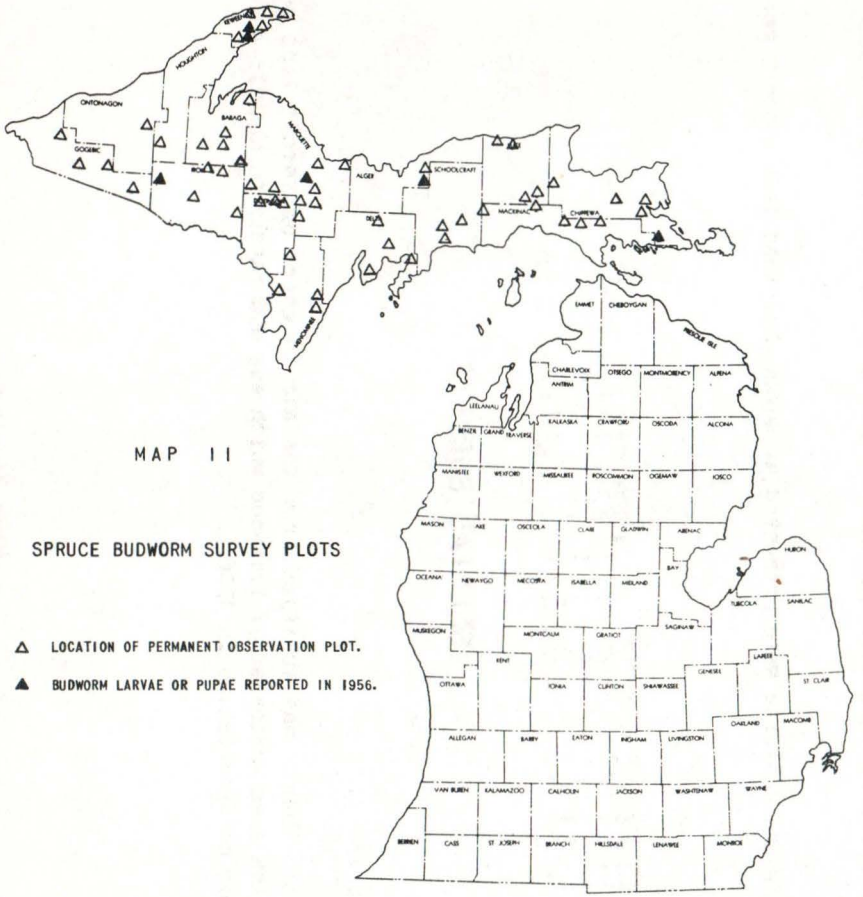
Similar programs and exhibits were presented at seven Christmas tree growers meetings.

* * *

SPECIAL SURVEYS

FOREST TENT CATERPILLAR

In June, Gogebic County was surveyed from the air to check on forest tent caterpillar activity. Most of the area northwest of Ironwood which was moderately to heavily defoliated in 1955 showed little or no defoliation in 1956.

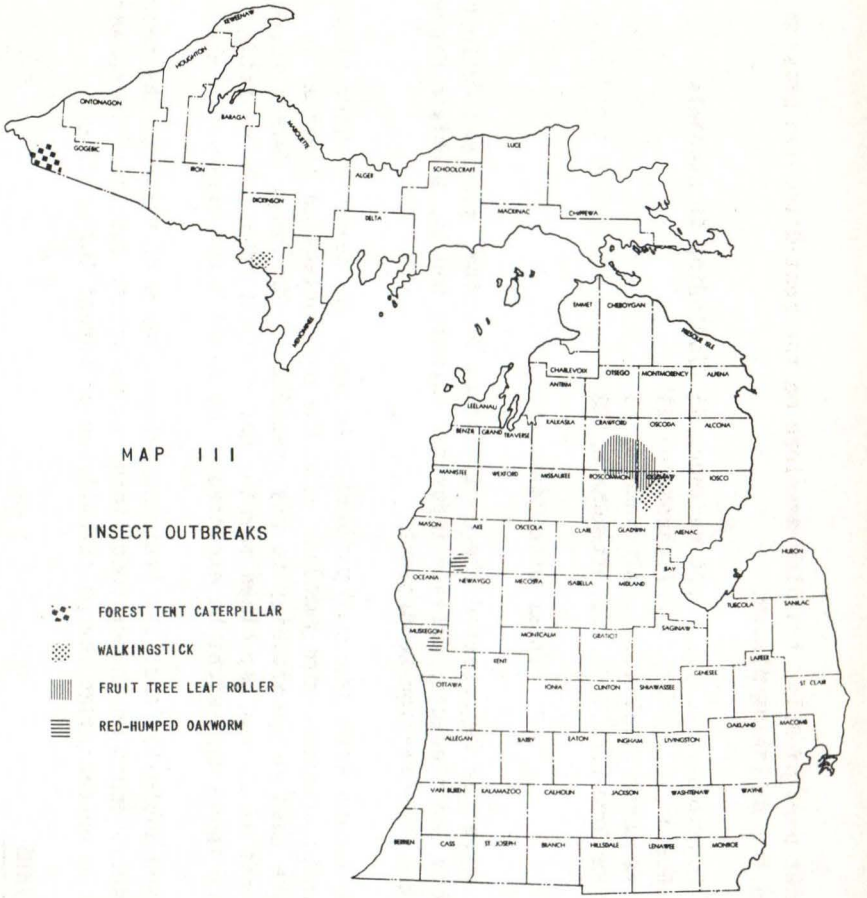


MAP II

SPRUCE BUDWORM SURVEY PLOTS

△ LOCATION OF PERMANENT OBSERVATION PLOT.

▲ BUDWORM LARVAE OR PUPAE REPORTED IN 1956.



MAP III

INSECT OUTBREAKS

FOREST TENT CATERPILLAR

WALKINGSTICK

FRUIT TREE LEAF ROLLER

RED-HUMPED OAKWORM

Light to moderate defoliation with spots of complete stripping were apparent south of US-2 from Bessemer to Marenisco. (See Map III). No tent caterpillar activity was noted there in 1955. Large numbers of parasitic flies were present in the infestation and it is therefore expected that the outbreak will subside in 1957.

WHITE GRUBS

Surveys by district foresters on the Lake Superior and Mackinac State Forests revealed that white grubs had killed about 40 per cent of the fall 1955 and spring 1956 planted jack pine in the Danaher plains area.

During August this area, and proposed planting sites in the immediate vicinity were inspected for white grub populations. The results showed that one grub was present per three square feet of soil, which according to standards used in the past, should not result in serious damage.

SPRUCE BUDWORM

The spruce budworm has been the subject of a "beating" survey for two years in Michigan, Wisconsin and Minnesota. The survey is under the direction of the Lake States Forest Experiment Station which is responsible for correlating the survey data for the three states.

In 1955, with the state district foresters acting as coordinators, 58 survey plots were established in the Upper Peninsula. Each plot consisted of three balsam trees from which the budworm larvae or pupae were collected by placing a sheet on the ground under the tree and beating the lower ten feet of live crown with a pole. The resulting count is only an indication of the presence or absence of the insect and cannot be fully evaluated until records for several years are available. However, by sampling the same trees in successive years, population trends may be noted.

Results of the 1955 and 1956 surveys are:

	1955	1956
Total Plots	58	58
Total Positive Reports	12	6

Total number of larvae or pupae on parts of three trees sampled:

0 larva or pupa	46 plots	52 plots
1 larva or pupa	7 plots	4 plots
2 larvae or pupae	0 plots	1 plots
3 to 6 larvae or pupae	4 plots	0 plots
7 to 10 larvae or pupae	0 plots	1 plots
14 larvae or pupae	1 plots	0 plots

Two of the positive reports came from Keweenaw County, one each from Iron, Marquette, Alger and Chippewa counties. Except for the reports for Keweenaw County, it is probable that the budworms found represent the normal endemic population. The difference in results of the 1955 and 1956 surveys probably represents a sampling error rather than a drop in population level. (See Map II).

RED-HEADED PINE SAWFLY

Following a report of sawfly activity in Antrim County a survey was made of ten forties in Sec. 24 and 25, T 29 N, R 5 W. The jack pine was planted in strips in 1951, and during the fall of 1956 the alternate strips were planted with red pine. Ten per cent of the jack pine trees were found to be infested. Some trees already had been killed.

An egg survey will be made in 1957 and followed up by control measures if deemed advisable.

PINE TORTOISE SCALE

An aerial survey in June showed that 400 acres of jack pine in Chippewa County north of Trout Lake were infested with the pine tortoise scale. This outbreak was first found in the fall of 1955 and collapsed during 1956, due largely to parasites. Twenty-five to 50 per cent of the low value, open grown jack pine were killed on the area before the infestation diminished. No control program in 1957 is contemplated. (See Map IV).

RED-HUMPED OAKWORM

Areas of oak defoliation in Muskegon and Lake counties were checked by state foresters on the Pere Marquette Forest. Almost complete defoliation occurred on 3,840 acres around Twin Lakes in Muskegon County and 4,160 acres north of Big Star Lake in Lake County. (See Map III).

FRUIT TREE LEAF ROLLER

A ground survey was made in July to determine the limits of the fruit tree leaf roller defoliation. Oak throughout most of Crawford County and adjacent areas, as shown on Map III, was defoliated in varying degrees from light to complete. This is the first time in recent years that this insect has caused widespread defoliation of oak in Michigan. It is expected that the outbreak will collapse as suddenly as it appeared.

* * *

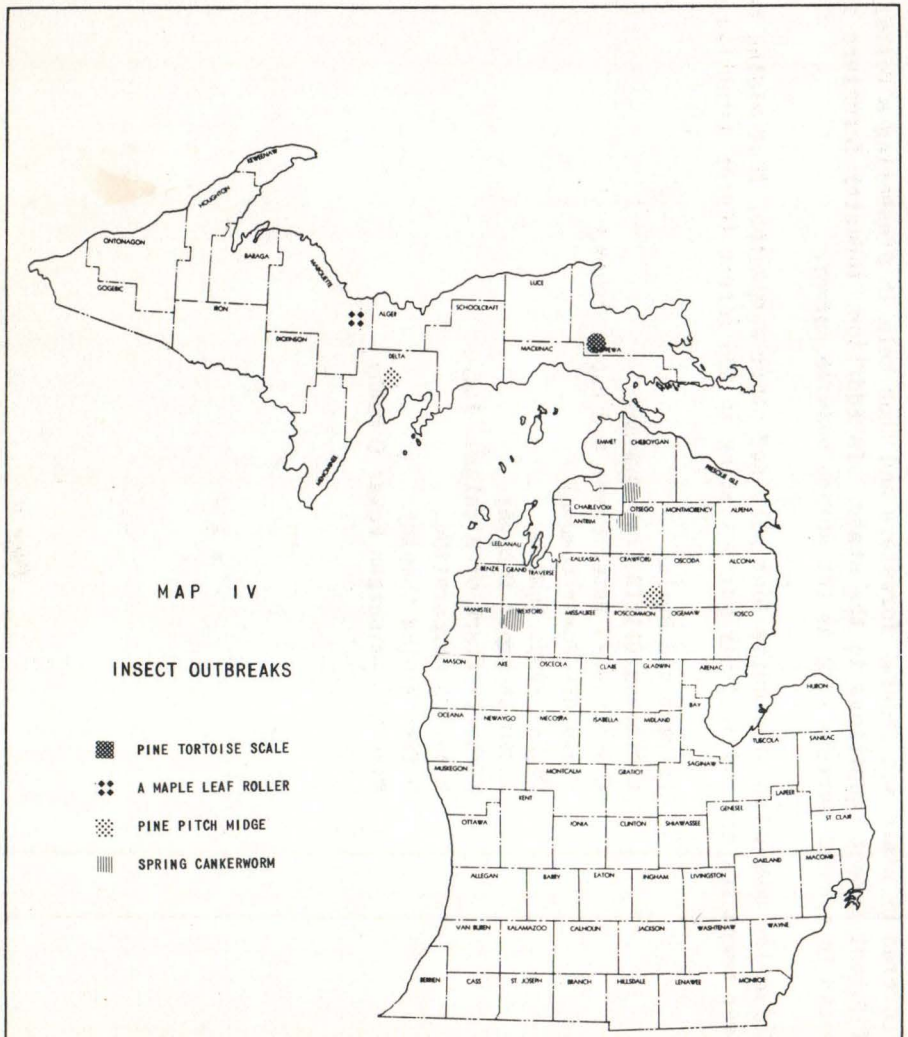
CONTROL PROJECTS

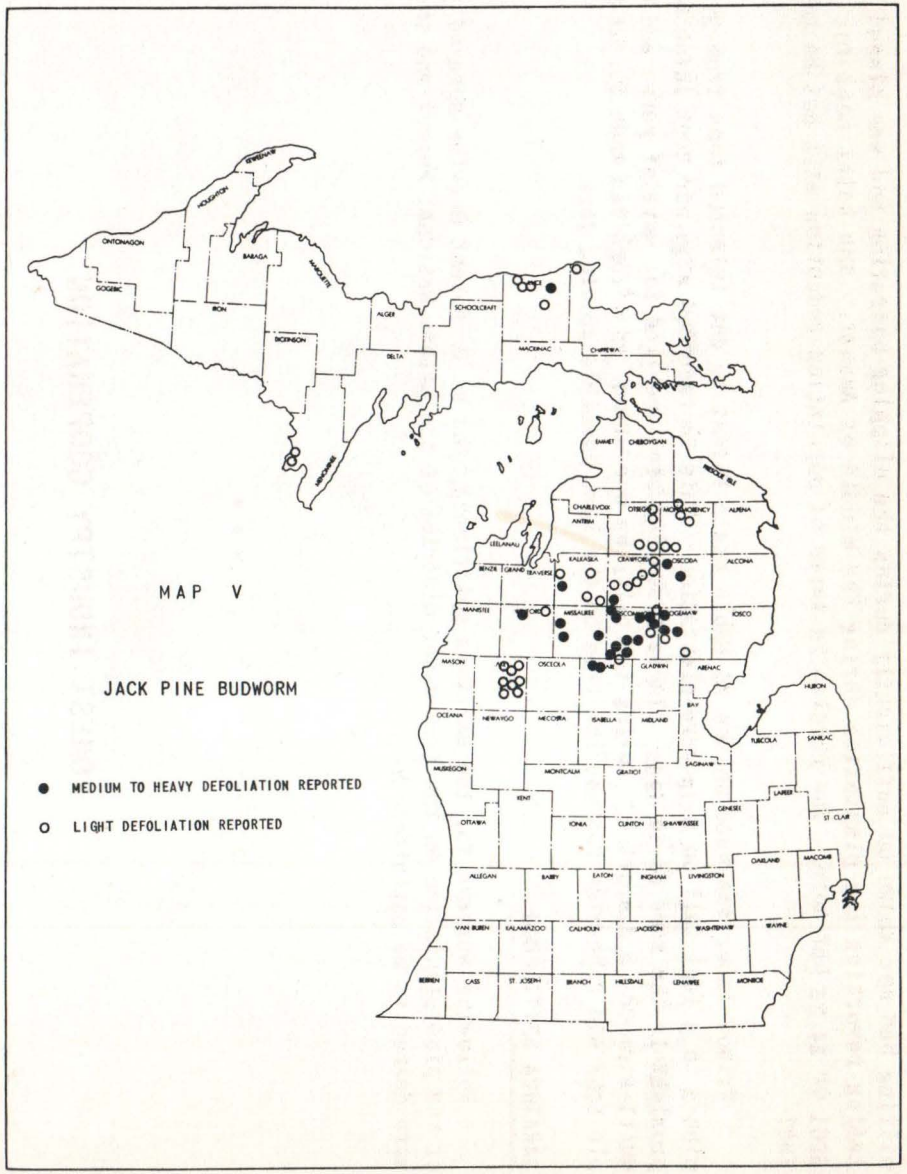
Control projects on state land in 1956 were directed against the white pine weevil, and on U. S. Forest Service land against the Saratoga spittlebug. On private land, control was mainly directed toward the white pine weevil, European pine shoot moth and pine sawflies in Christmas tree plantations. An area of approximately 99,000 acres was sprayed for gypsy moth control by the Michigan Department of Agriculture. Details of the gypsy moth spraying, as well as the oak wilt and Dutch elm disease control programs, are given under the sections on "Other Important Insects" and "Diseases."

WHITE PINE WEEVIL

Spraying -- Control operations on state land in 1956 were aimed at the white pine weevil. On the Alpena State Forest, 4.3 acres of 3 to 5 foot jack pine were sprayed with hand sprayers by Boy Scouts from Alpena troops. This plantation was established in 1951 and has been cared for by the Boy Scouts. Good control was obtained on the trees sprayed; however, difficulty in supervision caused some trees to be missed resulting in some weeviling.

Clipping -- On the Fife Lake State Forest, 29.25 man days were expended clipping infested leaders from 11,100 trees on 83 acres of 4 to 7 foot jack pine. This represented a 12 per cent infestation compared to 3 per cent in 1955. The tops were clipped between July 17 and 23 and were burned, destroying the larvae and pupae inside. Subsequent examinations showed that some


MAP IV
INSECT OUTBREAKS
PINE TORTOISE SCALE
A MAPLE LEAF ROLLER
PINE PITCH MIDGE
SPRING CANKERWORM


MAP V
JACK PINE BUDWORM
MEDIUM TO HEAVY DEFOLIATION REPORTED
LIGHT DEFOLIATION REPORTED

wilting had not shown up sufficiently during the clipping operation and was missed, necessitating reworking the plantation during the middle of August. The total cost for labor was $361 or $4.35 per acre. The results in terms of population reduction will not be known until 1957.

Prison labor was used on the Au Sable State Forest to cut infested tops from 37,000 jack pine 3 to 5 feet tall on a 78 acre plantation. This represented a 40 per cent infestation, approximately the same as in 1955. These trees had been weeviled for several years and many were multi-stemmed or distorted. During the clipping operation, an effort was made to cut out multiple tops and otherwise reshape the tree to the best possible growing form.

SARATOGA SPITTLEBUG

Following surveys for the Saratoga spittlebug, the U. S. Forest Service sprayed 212 acres of red pine plantation on the Iron River district of the Ottawa National Forest and the results were deemed to be satisfactory.

* * *

FOREST INDUSTRY COOPERATION

Industry foresters cooperate in the detection program by reporting on observation plots in areas not covered by state and federal foresters and thus help in presenting a better over-all picture of forest insect conditions in the state. In addition, industry foresters are called upon to assist in special surveys such as the spruce budworm survey.

The following companies, including four pulp and paper companies, four mining companies, and two power companies are now actively participating in the forest insect detection program.

Calumet and Hecla
Cleveland Cliffs Iron Company
Consolidated Water Power and Paper Company
Consumers Power Company
Copper Range Company
Escanaba Paper Company
Kimberly-Clark of Michigan, Inc.
Marathon Corporation
Oliver Mining Company
Wisconsin-Michigan Power Company

* * *

OBSERVATION REPORTS

A total of 2,011 observation reports was received and analyzed by the Lansing office of the Forestry Division. This was a decrease of 180 reports from the 1955 total due largely to the elimination of the larch casebearer and pine spittlebug from the critical insect list. In addition to the regular reports, 70 letters were received with observations on other forest insect conditions.

The total number of permanent observation areas is now 718. The decrease of 42 plots from the 1955 total of 760 is the result of the dropping of plots for which no reports have been received since 1953, or which were unsuitable because of changed conditions or for some other reason. (See Map I)

* * *

CRITICAL INSECTS

The list of critical insects in Michigan has been changed from time to time to include actively or potentially injurious forest insects and to remove from the list those which are no longer considered thus. Accordingly, the larch casebearer and the pine spittlebug were removed from the critical list in 1956 due to their lack of potential injury.

No additions or deletions are expected to be made in the critical insects reported on in 1957.

JACK PINE BUDWORM - *Choristoneura pinus* Free

Summary of Reports

	1951	1952	1953	1954	1955	1956
Total.....	135	185	232	280	291	276
Per cent Positive.....	38	40	32	20	20	29

Breakdown of 1956 Reports

Heavy defoliation (61-100%)..... 2.....(2.5%)
Medium defoliation (21-60%).....21.....(26.2%)
Light defoliation (1-20%).....57.....(71.3%)

Pine budworm larvae were found in most jack pine stands in the Lower Peninsula and eastern end of the Upper Peninsula, with noticeable defoliation occurring mainly in north central Lower Peninsula. The over-all infestation is about the same as in 1955, and considerably lower than during the period 1950 to 1953.

Moderate to heavy defoliation was reported in some stands in Kalkaska, Crawford, Oscoda, Wexford, Missaukee, Roscommon, Ogemaw and Clare counties in the Lower Peninsula and Luce County in the Upper Peninsula.

The infestation in northern Luce County in the Upper Peninsula which reached its peak in 1953 and 1954, shifted from commercial stands of jack pine to low value orchard type jack pine where some mortality has occurred. This outbreak has now greatly diminished, and does not appear to be an immediate problem. (See Map V)

RED-HEADED PINE SAWFLY - *Neodiprion lecontei* (Fitch)

Summary of Reports

	1951	1952	1953	1954	1955	1956
Total.....	133	173	231	230	260	255
Per cent Positive....	18	7	8	8	5	5

Breakdown of 1956 Reports

Heavy defoliation.....(11-100% susceptible trees attacked).....1.....(7.7%)
Medium defoliation.....(2-10% susceptible trees attacked).....3.....(23.1%)
Light defoliation.....(0-1% susceptible trees attacked).....9.....(69.2%)

Widely scattered outbreaks of the red-headed pine sawfly continued to occur in the northern half of the Lower Peninsula, and in the Upper Peninsula on red and jack pines. Generally, some trees are killed before outbreaks decline. Moderate to heavy defoliation was reported in Menominee, Luce and Antrim counties. (See Map VI)

LARCH SAWFLY - *Pristiphora erichsonii* (Htg.)

Summary of Reports

	1951	1952	1953	1954	1955	1956
Total.....	68	113	137	135	145	140
Per cent Positive....	0	30 *	42	73 *	66	81

* THE APPARENT INCREASE IS LARGELY DUE TO INTENSIFIED SURVEYS RATHER THAN BUILDUP OF INSECT POPULATIONS.

Breakdown of 1956 Reports

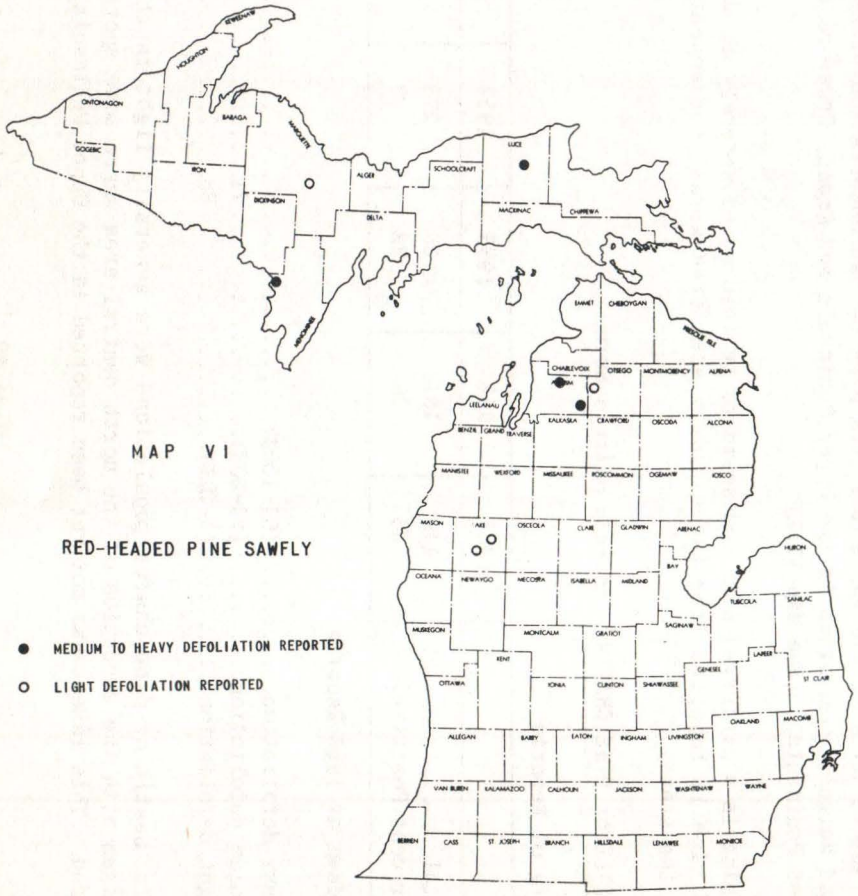
Heavy defoliation.....(61-100%).....10.....(8.9%)
Medium defoliation.....(21-60%).....38.....(33.6%)
Light defoliation.....(1-20%).....65.....(57.5%)

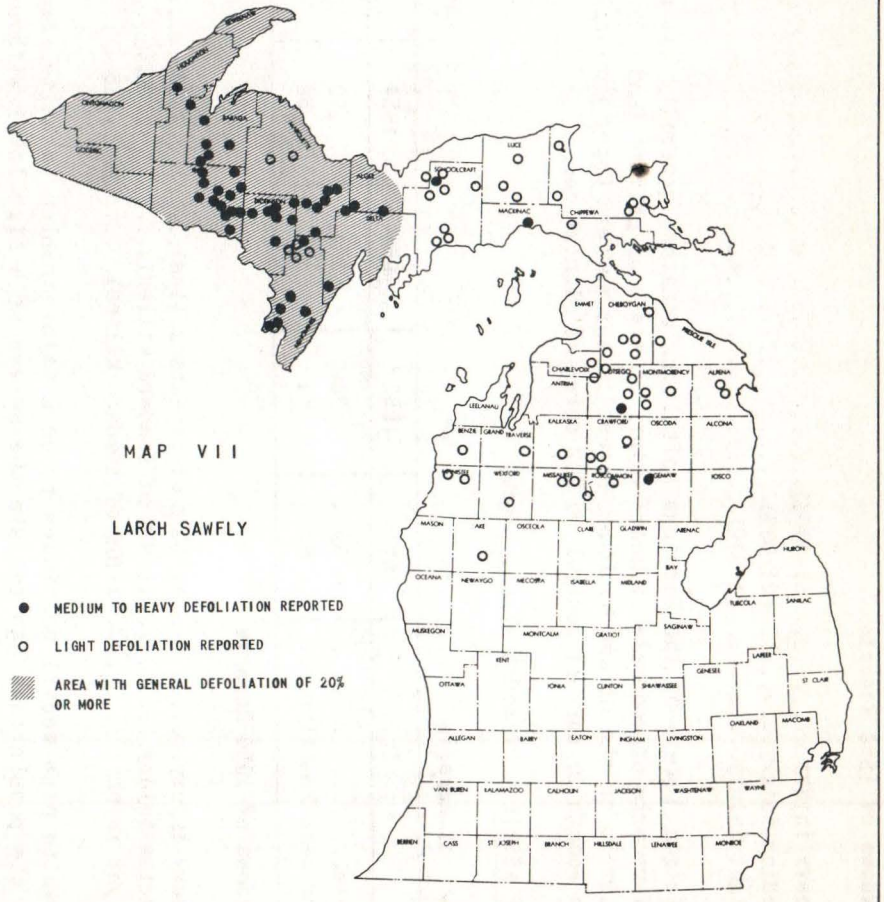
The larch sawfly is on the increase throughout the Upper Peninsula and northern half of the Lower Peninsula. This is shown by the increase in reports of moderate defoliation. The heaviest defoliation occurred in the western half of the Upper Peninsula with complete defoliation in many stands. No tree mortality due to the current sawfly outbreak has been reported in Michigan. (See Map VII)

SARATOGA SPITTLEBUG - *Aphrophora saratogensis* (Fitch)

Summary of Reports

	1951	1952	1953	1954	1955	1956
Total.....	17	51	164	211	229	225
Per cent Positive....	88	27	34	23	28	27


MAP VI
RED-HEADED PINE SAWFLY
MEDIUM TO HEAVY DEFOLIATION REPORTED
LIGHT DEFOLIATION REPORTED


MAP VII
LARCH SAWFLY
MEDIUM TO HEAVY DEFOLIATION REPORTED
LIGHT DEFOLIATION REPORTED
AREA WITH GENERAL DEFOLIATION OF 20% OR MORE

Breakdown of 1956 Reports

Heavy injury	(61-100%)	0	(0.0%)
Medium injury	(21-60%)	0	(0.0%)
Light injury	(1-20%)	60	(100.0%)

Population levels of the Saratoga spittlebug remained generally low as indicated by the absence of reports of moderate or heavy injury on state or private land. However, U. S. Forest Service surveys on the Ottawa National Forest in the western Upper Peninsula revealed populations high enough to warrant control on 212 acres of plantations.

WHITE PINE WEEVIL - *Pissodes strobi* (Peck)

Summary of Reports

	1951	1952	1953	1954	1955	1956
Total	39	33	231	278	319	306
Per cent Positive	82	64	65	59	60	53

Breakdown of 1956 Reports

Heavy injury	(41-100% of leaders killed)	16	(9.9%)
Medium injury	(11-40% of leaders killed)	30	(18.5%)
Light injury	(1-10% of leaders killed)	116	(71.6%)

The white pine weevil continues to be a major problem in white, Scotch and jack pine stands as the populations can sustain themselves at a high level without the fluctuations characteristic of many other insects. Heaviest damage is occurring in the north half of the Lower Peninsula, with lesser damage in the south half and in the Upper Peninsula. Terminal killing of 40% or more of the white and jack pine on the observation areas was reported from Chippewa and Marquette counties in the Upper Peninsula and Emmet, Crawford and Otsego counties in the Lower Peninsula. (See Map VIII)

Jack pine is a preferred host and seems to be injured as severely as white pine. Weeviling on red pine is reported from three widely scattered areas, and appears to be increasing throughout the state.

ANOMALA BEETLE or PINE CHAFER - *Anomala oblivia* Horn

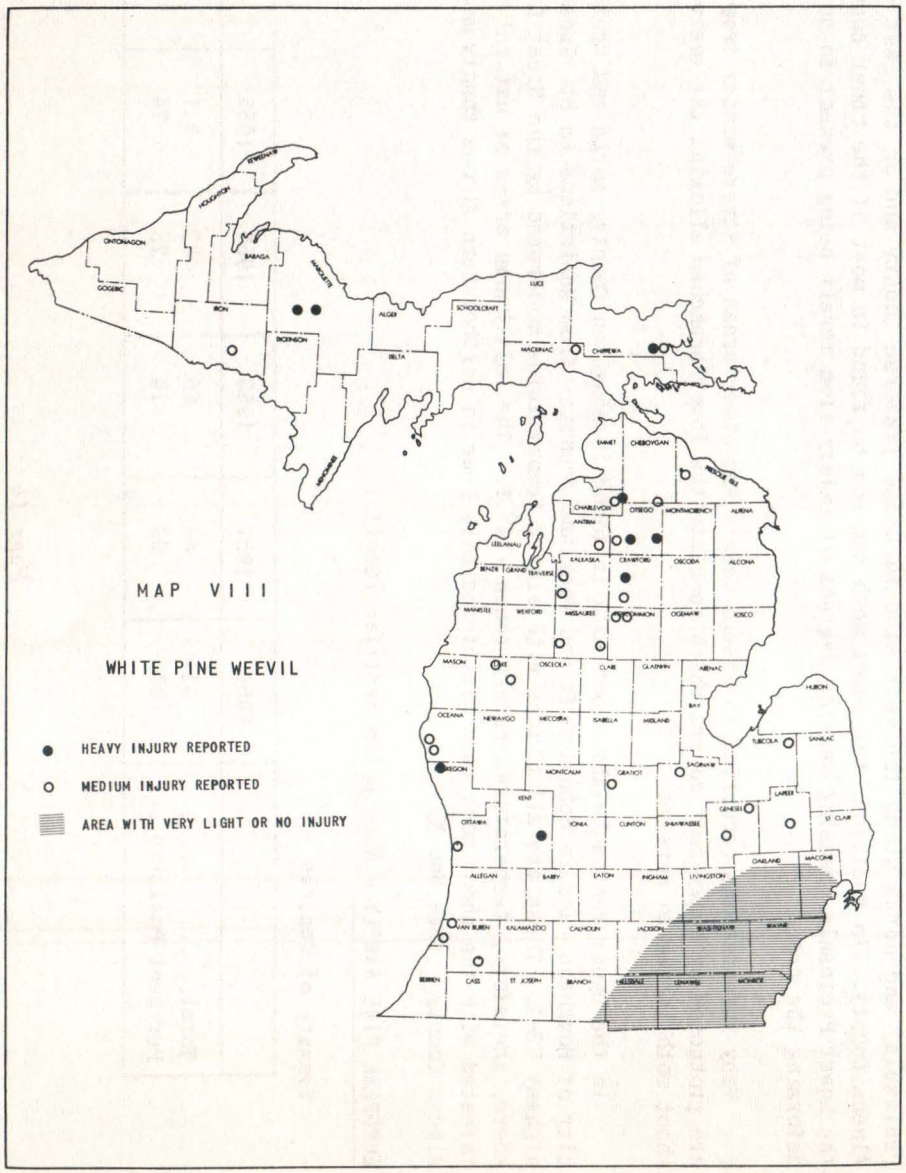
Summary of Reports

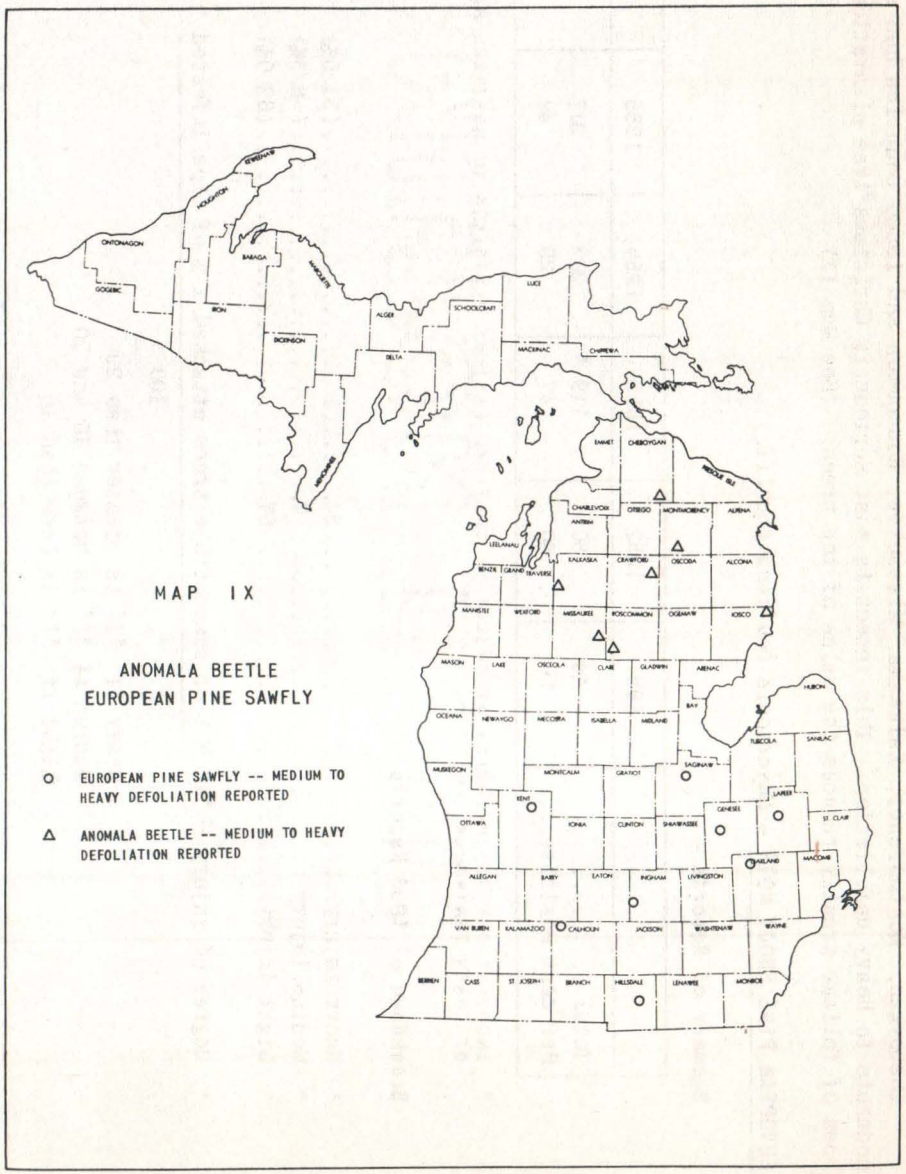
	1951	1952	1953	1954	1955	1956
Total	119	181	236	278	275	271
Per cent Positive	35	36	32	38	38	37

Breakdown of 1956 Reports

Heavy defoliation	(61-100%)	3	(3.0%)
Medium defoliation	(21-60%)	11	(11.1%)
Light defoliation	(1-20%)	85	(85.9%)

Anomala beetle or pine chafer populations were generally light in the northern half of Lower Michigan with the exception of the north central area where some spots of heavy defoliation occurred. This insect has not yet been reported in the Upper Peninsula.


MAP VIII
WHITE PINE WEEVIL
HEAVY INJURY REPORTED
MEDIUM INJURY REPORTED
AREA WITH VERY LIGHT OR NO INJURY


MAP IX
ANOMALA BEETLE
EUROPEAN PINE SAWFLY
EUROPEAN PINE SAWFLY -- MEDIUM TO HEAVY DEFOLIATION REPORTED
ANOMALA BEETLE -- MEDIUM TO HEAVY DEFOLIATION REPORTED

Cheboygan, Montmorency, Kalkaska, Missaukee, Roscommon and Iosco counties had spots of moderate to heavy defoliation. This insect is most serious in Christmas tree plantations where loss of foliage greatly reduces the value of the trees. (See Map IX)

EUROPEAN PINE SHOOT MOTH - *Rhyacionia bouliana* (Schiff.)

Summary of Reports

	1951	1952	1953	1954	1955	1956
Total.....	44	80	119 *	203	207	258
Per cent Positive....	80	40	47	39	49	42

* INCREASE DUE TO INCLUSION OF INSECT ON CRITICAL LIST OF DISTRICTS IN NORTHERN HALF OF LOWER PENINSULA.

Breakdown of 1956 Reports

* Heavy injury.....34.....(31.5%)
* Medium injury..... 7.....(6.5%)
* Light injury.....67.....(62.0%)

* Degree of injury = "I" = $\frac{\%\text{ of susceptible trees attacked} \times \%\text{ of tips infested}}{100}$

Heavy if "I" is greater than 20
Medium if "I" is between 10 and 20
Light if "I" is less than 10

Serious injury by the European pine shoot moth occurs in the southern half of the Lower Peninsula, and north along the west side to Grand Traverse County and on the east coast to Alpena County. In addition, the shoot moth can now be found in most of the other counties in the Lower Peninsula, causing varying degrees of injury from merely being present to noticeably deforming the trees.

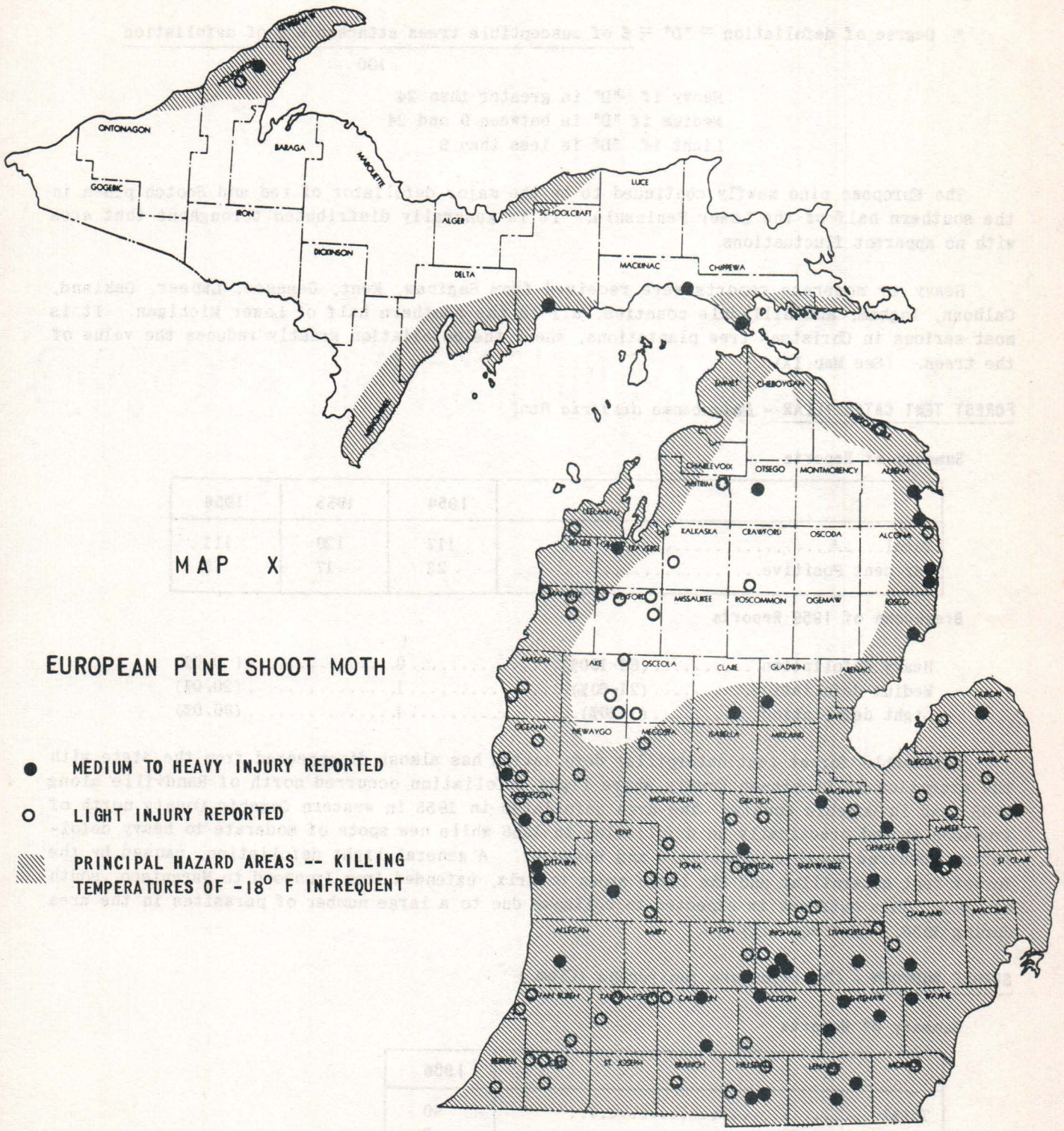
Many infestations occurring in Otsego County and other areas of severe winter temperatures are protected by heavy snow covers which insulate the lower branches allowing the overwintering shoot moth larvae to survive.

In the Upper Peninsula the shoot moth is found in Houghton County, north and south of the city of Houghton, and in Schoolcraft and Mackinac counties from Manistique to St. Ignace along highway US-2. These are all places with winter temperatures moderated by the Great Lakes and where, therefore, temperatures rarely reach -18° F. The only known areas of natural red pine infested with the shoot moth were discovered this year in northeastern Alcona County and eastern Alpena County. (See Map X)

EUROPEAN PINE SAWFLY - *Neodiprion sertifer* (Geoff.)

Summary of Reports

	1951	1952	1953	1954	1955	1956
Total.....	31	64	85	82	111	100
Per cent Positive....	87	69	74	75	74	62



MAP X

EUROPEAN PINE SHOOT MOTH

● MEDIUM TO HEAVY INJURY REPORTED

○ LIGHT INJURY REPORTED

▨ PRINCIPAL HAZARD AREAS -- KILLING TEMPERATURES OF -18° F INFREQUENT

Breakdown of 1956 Reports

* Heavy defoliation..... 2.....(3.2%)
* Medium defoliation..... 3.....(4.8%)
* Light defoliation.....57.....(92.0%)

* Degree of defoliation = "D" = $\frac{\%\text{ of susceptible trees attacked} \times \%\text{ of defoliation}}{100}$

Heavy if "D" is greater than 24
Medium if "D" is between 9 and 24
Light if "D" is less than 9

The European pine sawfly continued to be the major defoliator of red and Scotch pines in the southern half of the Lower Peninsula. It is generally distributed throughout that area with no apparent fluctuations.

Heavy or moderate reports were received from Saginaw, Kent, Genesee, Lapeer, Oakland, Calhoun, Ingham, and Hillsdale counties, all in the southern half of Lower Michigan. It is most serious in Christmas tree plantations, where the defoliation greatly reduces the value of the trees. (See Map IX)

FOREST TENT CATERPILLAR - *Malacosoma disstria* Hbn.

Summary of Reports

	1954	1955	1956
Total.....	117	120	111
Per cent Positive.....	23	17	5

Breakdown of 1956 Reports

Heavy defoliation.....(61-100%).....0.....(0.0%)
Medium defoliation.....(21-60%).....1.....(20.0%)
Light defoliation.....(1-20%).....4.....(80.0%)

Noticeable forest tent caterpillar defoliation has almost disappeared from the state with the exception of Dickinson County where light defoliation occurred north of Randville along M-95, and in Gogebic County. The area defoliated in 1955 in western Gogebic County north of Ironwood showed practically no defoliation in 1956 while new spots of moderate to heavy defoliation occurred south of Wakefield and Bessemer. A general light defoliation, caused by the forest tent caterpillar and the large aspen tortrix, extended from Ironwood to Marenisco, south of US-2. This outbreak is expected to collapse due to a large number of parasites in the area during 1956. (See Map III)

SPRUCE BUDWORM - *Choristoneura fumiferana* (Clem.)

Summary of Reports

	1956
Total.....	40
Per cent Positive.....	2

Breakdown of 1956 Reports

Heavy defoliation (61-100%)	0	(0%)
Medium defoliation (21-100%)	0	(0%)
Light defoliation (1-20%)	1	(100%)

The spruce budworm was added to the list of critical insects in 1955 following the detection in 1954 of an outbreak in Keweenaw County. Surveys in 1954 showed heavy to complete defoliation on 2,500 acres of old-growth balsam and lighter infestations in other smaller areas of undetermined size. Logging operations, stepped up in an effort to control the insect, together with parasites and other causes, contributed to a decline of this infestation in 1955.

No new areas of spruce budworm outbreaks were found in Michigan in 1956. Beating plots distributed throughout the Upper Peninsula indicated that the budworm population was at a very low level or absent in most areas. The population in Keweenaw County apparently is declining, as either fewer or no larvae were found on the beating plots as compared to 1955. It is not expected to become a serious threat over most of the Upper Peninsula because of the scattered occurrence and variability in size, age, stocking and mixtures of the balsam stands.

* * *

OTHER IMPORTANT INSECTS

GYPSY MOTH - *Porthetria dispar* (L.)

The following information on the gypsy moth was received from the Division of Plant Industry, Michigan Department of Agriculture, and is a summary of their work on the gypsy moth during 1956.

As a result of the trapping program during the summer of 1955, there were 23 traps that attracted a total of 32 moths. From these finds, an area of approximately 98,860 acres was established and sprayed with the use of 5 Stearman 450 horse-power airplanes. The spraying operations began on May 7 and were completed on May 22. A heavy amount of rain fell during the first 2 weeks causing a change in the use of airfields. Three of the fields could not be used because of the water-soaked turf and this caused longer ferrying distances for the contractor.

In the latter part of June, a trapping program was initiated to check on the effectiveness of the spraying operation and to detect any new infestations which might be present. A total of 4,942 traps were used to survey approximately 1,445,760 acres of territory. Two moths were recovered this year. One find was located 2 miles northwest of the largest area sprayed this spring. The other moth was trapped 9 miles southeast of an area where 13 egg clusters were found and 12 square miles had been sprayed.

Once again an area to be sprayed will be determined from these finds and the operation will take place in the spring of 1957. In order to safely say that this pest has been eradicated, it will be necessary to have two years of negative trapping results.

WALKINGSTICK - *Diapheromera femorata* (Say)

Walkingsticks defoliated oak on 800 acres in Dickinson County (Upper Peninsula) and 45,000 acres in Ogemaw County (Lower Peninsula). In the latter area some trees have died after 25 years of alternate year defoliation. (See Map III).

FRUIT TREE LEAF ROLLER - *Archips argyrospila* (Wlk.)

During June the **fruit tree leaf roller** defoliated oak on 214,500 acres centering in Crawford County. This is the first reported widespread defoliation of oak by this insect and it is not expected to cause tree mortality. However, it is a serious nuisance to the local residents when it crawls all over buildings. In northwest Ogemaw County, walkingsticks followed the fruit tree leaf roller, eating the leaves on the refoliated trees. (See Map III).

RED-HUMPED OAKWORM - *Symnerista albicosta* (Hbn.)

The **red-humped oakworm** stripped oak on 3,840 acres in Muskegon County and 4,160 acres in Lake County, both in Lower Michigan. These outbreaks are expected to disappear without having any detrimental effects on the trees. (See Map III)

SPRING CANKERWORM - *Paleacrita vernata* (Peck)

Spring cankerworms defoliated elm in localized spots in north central Lower Michigan causing some mortality in Otsego County where it has been active for at least ten years. (See Map IV).

PINE TORTOISE SCALE - *Toumeyella numismaticum* (P. & M.)

An outbreak of the **pine tortoise scale** was discovered late in 1955 in Chippewa County after it had killed the majority of jack pine on 400 acres. The outbreak succumbed during the summer of 1956 probably due largely to parasites. (See Map IV).

LARGE ASPEN TORTRIX - *Archips conflictana* (Wlk.)

The **large aspen tortrix** was responsible for areas of aspen defoliation throughout the Upper Peninsula, in some places eating 75% or more of the leaves on areas upwards of two townships in size. This insect has occurred in the Upper Peninsula for several years but generally does not infest the same area year after year.

PINE NEEDLE MINER - *Exoteleia pinifoliella* (Chamb.)

Pine needle miners were common on jack pine in northern Lower Michigan and mined over 50% of the needles in some places. They are not expected to cause any permanent injury although there may be some reduction in growth.

PINE PITCH MIDGE - *Retinodiplosis* sp.

Pine pitch midge injury on jack pine is increasing throughout the state with flagging prominent in Delta and Crawford counties. (See Map IV)

LARCH CASEBEARER - *Coleophora laricella* (Hbn.)

The larch casebearer can be found in most larch stands but no noticeable defoliation was found.

JACK PINE SAWFLY - *Neodiprion pratti banksianae* Roh.

The jack pine sawfly was responsible for defoliating a 40-acre stand of jack pine in Crawford County and one in Roscommon County (Lower Peninsula).

* * *

DISEASES

OAK WILT

Oak wilt disease was first confirmed in Michigan in 1951, although there is evidence to show that it had been present in the state for several years prior to that time. Annual surveys since 1951 have located the disease in 22 southern Michigan counties, with the greatest concentration in the southwestern area. In spite of its persistence over the years, the disease has spread rather slowly, a fact which lends considerable hope to the control program begun this year.

Three Conservation Department planes were used in the 1956 aerial survey which covered 26 complete counties and parts of three others between July 6 and July 30. Strips were flown at two-mile intervals at an altitude of 1,000 feet. Approximately 9,000 miles of line were covered. Total flying time was 151 hours, and the cost was $1,085.35 for planes and pilots.

Suspected new spots located from the air, as well as old known locations were checked on the ground by Conservation Department district foresters and State Department of Agriculture field inspectors to determine the presence or absence of active wilt. Wilt was found at a total of 117 locations, including 73 new spots and 44 old ones. Although field identification of the disease is fairly positive, 79 samples were sent to the laboratory at Michigan State University for culturing. Oak wilt was identified in 52 of these samples.

This year's control program was handled directly by the Division of Plant Industry of the State Department of Agriculture, rather than relying on voluntary removal of diseased trees by the owners which had been attempted for two years. The treatment included the girdling of the infected trees plus those healthy oaks which were considered to be within root range of the infected ones. A solution of 2,4-D Amine was applied to the girdles to hasten the death of the

trees and to prevent sprouting. Thus, it is hoped to break the underground link around a diseased tree by preventing the spread through root grafts. Some cutting of diseased trees was done in a continuation of an experiment begun in 1954 in Kent and Barry counties. In all, 223 infected trees were girdled and chemically treated, and 48 were cut. A total of 1,100 healthy oaks within root range were killed.

Map XI shows the range of oak wilt in the state, and the number of areas treated by counties.

DUTCH ELM DISEASE

Dutch elm disease was discovered in the Detroit area in 1950, and has since spread across the southern part of the Lower Peninsula and as far north as Saginaw and Ottawa counties. (See Map XII).

A cooperative program of survey and control is coordinated by the State Department of Agriculture working with local units of government. This department is responsible for the survey and enforcement phase of the program, and the municipalities conduct the necessary sanitation and spraying. Laboratory facilities for diagnosing Dutch elm disease and oak wilt are maintained at Michigan State University.

The following statement regarding the 1956 Dutch elm disease program was prepared by the Division of Plant Industry of the State Department of Agriculture:

"During the 1956 season the scope of the Dutch Elm Disease program was enlarged to encompass almost all of the southern half of the Lower Peninsula in Michigan. Nearly every community in most counties was surveyed by the State or in some instances by their own forestry crews. As a result of this intensified program, many new communities were found to be infected with the disease. In all, 207 more communities were surveyed than last year which accounted for an increase in number of diseased trees found from 5,774 in 1955 to 8,000 in 1956. This increase can also be attributed to the normal rate of build-up in some areas where the incidence of the disease was very high. Grand Rapids and vicinity has been experiencing this trend, for in 1955 there were a total of 63 trees that were condemned for having the disease and in 1956 there were 1,384.

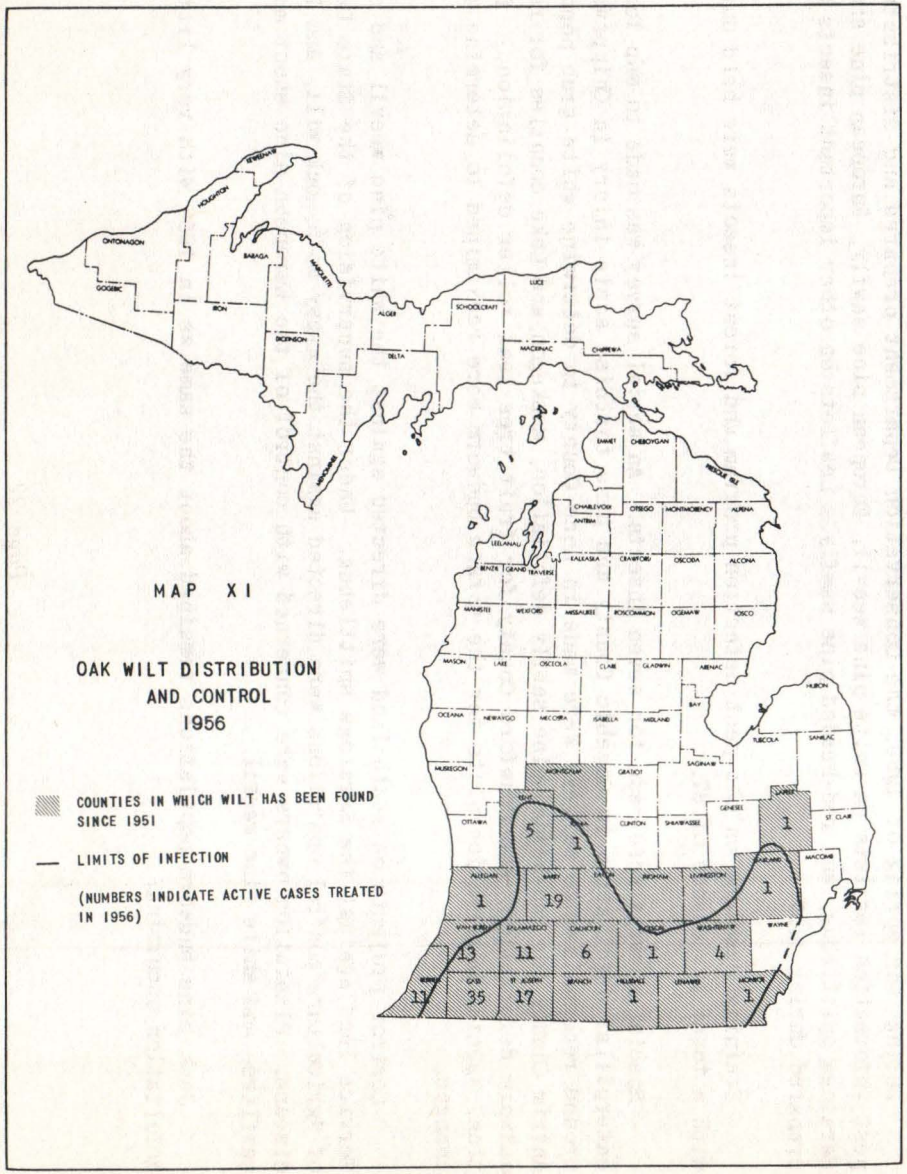
"There were 9,551 samples submitted to the Dutch Elm Disease Laboratory for testing and as previously mentioned approximately 8,000 were positive. Thus, 85 per cent of all samples submitted were positive cases.

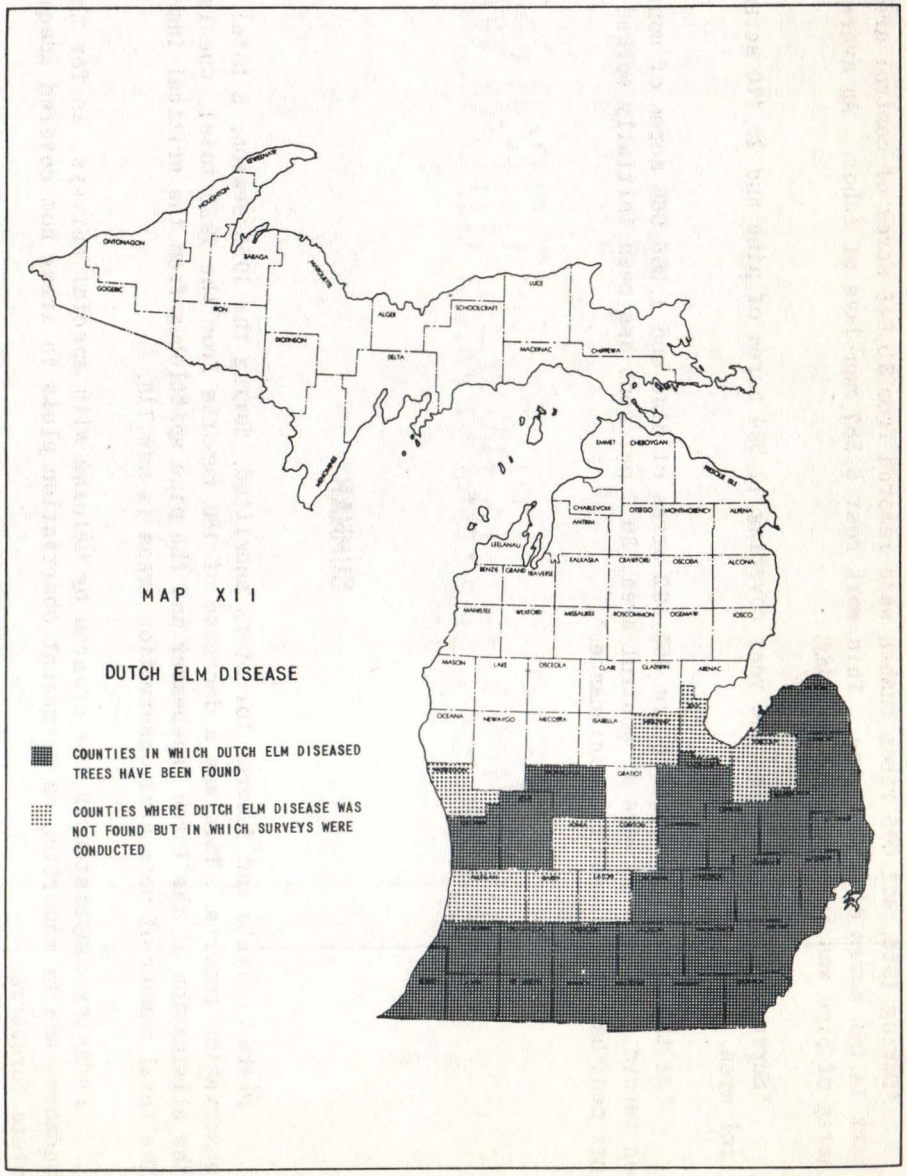
"While the survey portion of this program was enlarged, the sanitation part was also intensified. Along with the regular survey and sampling, all trees in a dead or dying condition were ordered to be removed and destroyed just as diseased trees were. As a result there was an increase of condemned trees in a dead or dying state from 8,282 in 1955 to 16,000 in 1956 or twice as many trees this year as compared to the previous year."

WHITE PINE BLISTER RUST

A detailed report of the white pine blister rust situation and control progress is prepared annually by the Area Leader for this cooperative federal-state project. A brief summary of this report for 1956 follows:

"Infection on ribes was heavy in the Upper Peninsula and northern third of the Lower Peninsula. Ribes infection was light and spotty in most of the remainder of the Lower Peninsula. White pine seedlings in unprotected stands are now showing some infection of 1954 origin. The majority of cankers, however, are of 1950 and 1951 origin.


MAP XI
OAK WILT DISTRIBUTION
AND CONTROL
1956
COUNTIES IN WHICH WILT HAS BEEN FOUND SINCE 1951
LIMITS OF INFECTION
(NUMBERS INDICATE ACTIVE CASES TREATED IN 1956)
5
1
1
19
1
13
11
6
1
4
17
35
17
1
1


MAP XII
DUTCH ELM DISEASE
COUNTIES IN WHICH DUTCH ELM DISEASED TREES HAVE BEEN FOUND
COUNTIES WHERE DUTCH ELM DISEASE WAS NOT FOUND BUT IN WHICH SURVEYS WERE CONDUCTED

"During 1956, 471,005 ribes bushes were removed from 30,648 acres of control area to protect 14,288 acres of white pine. This work cost 3,287 man-days of labor. An average of 4.3 acres of pine was protected per man-day.

"Surveys were made during the year covering 12,354 acres of pine and 26,170 acres of control area.

"At the present time there are 455,502 acres of pine and 1,266,066 acres of control area on record. Of this acreage of control area, 89.7 per cent has been initially worked and 46.1 per cent has been placed on maintenance."

* * *

SUMMARY

State, private and federal foresters submitted, during the 1956 season, a total of 2,011 observation reports. This was a decrease of 180 reports from the 1955 total, due largely to the elimination of the larch casebearer and the pine spittlebug from the critical insect list. The total number of permanent observation areas is now 718.

Industry cooperates in the program by helping with special surveys, as for the spruce budworm, and by reporting on permanent observation plots in areas not covered adequately by state foresters.

During the spring of 1956, the Conservation Department prepared and distributed forest pest information leaflets on white pine weevil, European pine sawfly, European pine shoot moth, Saratoga spittlebug, and red-headed pine sawfly. Leaflets on other important insects are to be prepared during 1957.

Training sessions on the pest detection program and forest insects were held during July with a total attendance of 87.

Special surveys were made for seven insects. An aerial survey was made to map forest tent caterpillar defoliation in Gogebic County and pine tortoise scale injury in Chippewa County. Ground reconnaissance surveys were made in Luce County to determine white grub populations, Antrim County for red-headed pine sawfly defoliation, Muskegon and Lake counties for red-humped oakworm defoliation, and Crawford County for fruit tree leaf roller defoliation. In addition, special observation plots for the spruce budworm were reexamined to determine population changes.

Control projects on state land were directed against the white pine weevil and on Forest Service land against the Saratoga spittlebug. Under the supervision of the State Department of Agriculture control operations were directed against the gypsy moth, oak wilt, and Dutch elm disease. Plantation owners were concerned with control of the European pine shoot moth, pine sawflies, and white pine weevil.

Jack pine budworm populations remained about the same as in 1956 with very little heavy defoliation occurring.

Widely scattered outbreaks of the red-headed pine sawfly occurred in the northern half of the Lower Peninsula and in the Upper Peninsula.

Larch sawfly defoliation continued to increase, particularly in the Upper Peninsula.

Saratoga spittlebug population remained generally low.

White pine weevil injury continued to be of major importance with 40 per cent or more weeviling reported in many areas.

Anomala beetle defoliation was generally light.

Injury caused by the European pine shoot moth continued to be the most serious problem in southern Michigan on red pine. New locations were found in the Upper Peninsula in Schoolcraft and Mackinac counties.

A new area of infestation by the forest tent caterpillar was found in Gogebic County. Other areas previously attacked showed no noticeable injury.

Spraying for the gypsy moth covered 98,860 acres in 1956. Trapping surveys found two moths, necessitating additional spraying in 1957.

Aerial survey of the south half of the Lower Peninsula detected 73 new cases of oak wilt. Control by girdling and chemically treating infected and surrounding oaks was undertaken in all active locations.

Dutch elm disease cases increased nearly 40 per cent as more communities in southern Michigan found the disease present. Nearly 8,000 trees were diagnosed as diseased, and another 16,000 condemned as hazzards. Community action and cooperation is helping materially in the control program.

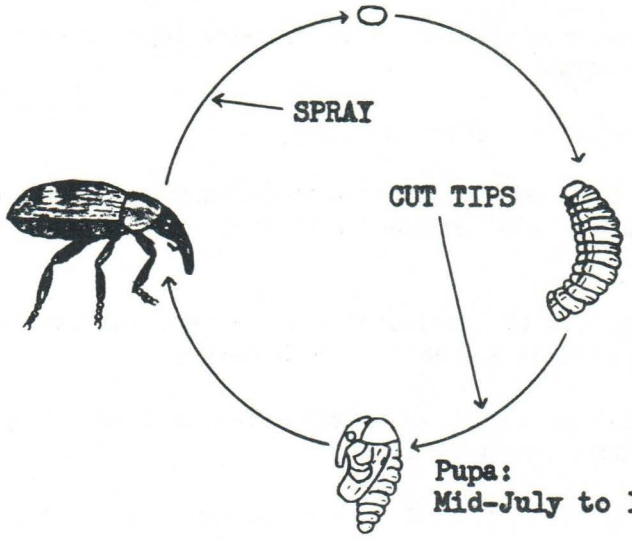
APPENDIX FOLLOWS

MICHIGAN FOREST PEST DETECTION PROGRAM*

INFORMATION SHEET NO. 1

WHITE PINE WEEVIL

Life Cycle:



Hosts: White, jack, Scotch, Austrian and red pines, and Norway spruce, mostly under 15 feet tall.

Type of Injury: Larvae feed under bark of terminal leader from May to August, killing it and deforming tree. New growth on leader curls over and wilts. Needles and bark turn brown. Emerging adult leaves small shot holes. Feeding of adult on leader in late April and May causes resin blobs to appear. These are useful in diagnosing presence of weevils at this time.

Description of Insect: Adult - snout beetle with hard wing covers, about 3/8 inch long, mottled brown with white hourglass figure across middle of back. Larvae - legless white grub 1/4 to 3/8 inch long.

Control Measures: Spray terminal shoots in spring when adults begin to appear, usually in late April, using 3# of DDT 50% wettable powder in 100 gals. water or 4# of lead arsenate in 100 gals. water. For smaller quantities use 3 tablespoons of DDT or 4 tablespoons of lead arsenate in 1 gal. of water. Or remove and burn tips that are infested in July, making sure to cut below the infested part which may extend 12 to 18" below the tip. Cutting and burning is designed to kill pupae and adults before they emerge and serves to reduce damage the following year. Aerial spraying - May give good control but thus far the results have not been consistent. Silviculture - A light hardwood overstory is desirable for white pine plantations since weevils seldom attack pine growing under such conditions.

Remarks: This is the most important insect pest of white pine. It occurs throughout Michigan except in the extreme southeastern section.

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*COOPERATORS: Forest Industries, Michigan State University, University of Michigan, Lake States Forest Experiment Station, U. S. Forest Service, Michigan Department of Agriculture, Michigan Department of Conservation.

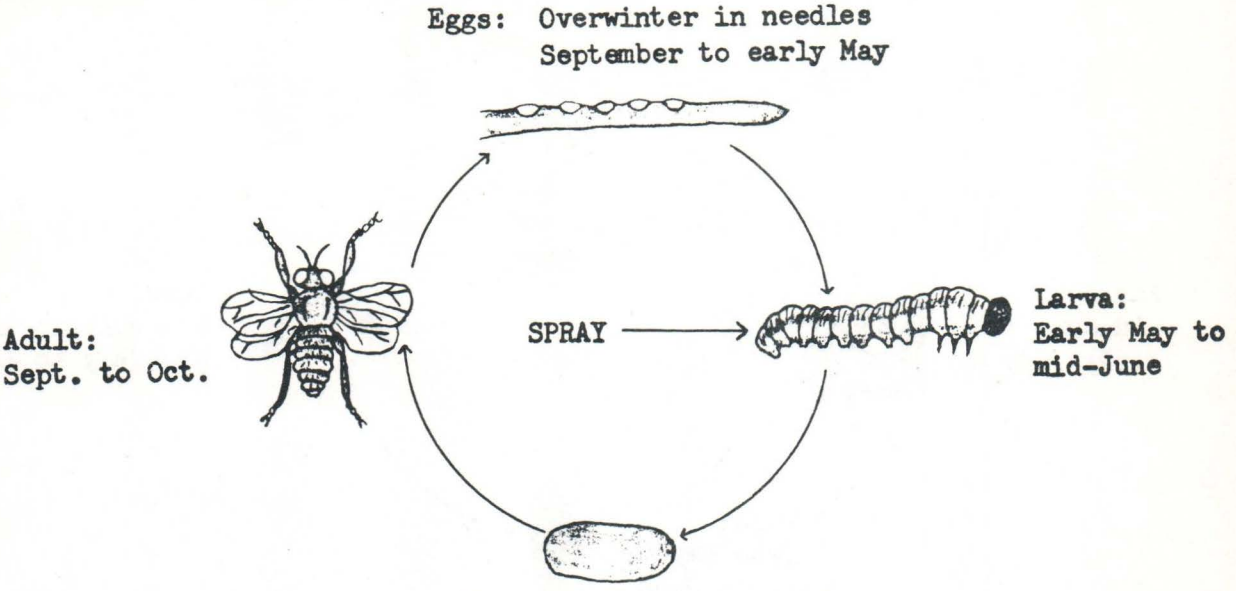
May 14, 1956 Printed by Michigan Department of Conservation

MICHIGAN FOREST PEST DETECTION PROGRAM*

INFORMATION SHEET NO. 2

EUROPEAN PINE SAWFLY

Life Cycle:



Hosts: Red, Scotch and jack pines. Primarily a pest of trees 2 to 15 feet tall, but will attack larger trees.

Type of Injury: Larvae feed in clusters on previous year's needles and may completely defoliate the tree. Early larval feeding causes needles to appear straw-like. Later all but needle base will be eaten. Heavy feeding produces an accumulation of small green-brown pellets under tree.

Description of Insect: Larva - 7/8 inch long when full grown, black head, body gray-green with lighter back line. On each side of back line are two whitish lines bordering a stripe of deep green. Adult - small fly-like insect, seldom seen.

Control Measures: When larvae appear, or about May 10-20, spray with 3# of DDT 50% wettable powder, or 3# of lead arsenate in 100 gallons of water. For smaller quantities use 3 tablespoons of the DDT or lead arsenate in 1 gallon of water. The smaller the larvae, the easier they are to kill. **Aerial spraying** - Oil base DDT has proven effective against this insect.

Remarks: Found principally in the south half of the Lower Peninsula. A relatively easy insect to control.

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*COOPERATORS: Forest Industries, Michigan State University, University of Michigan, Lake States Forest Experiment Station, U. S. Forest Service, Michigan Department of Agriculture, Michigan Department of Conservation.

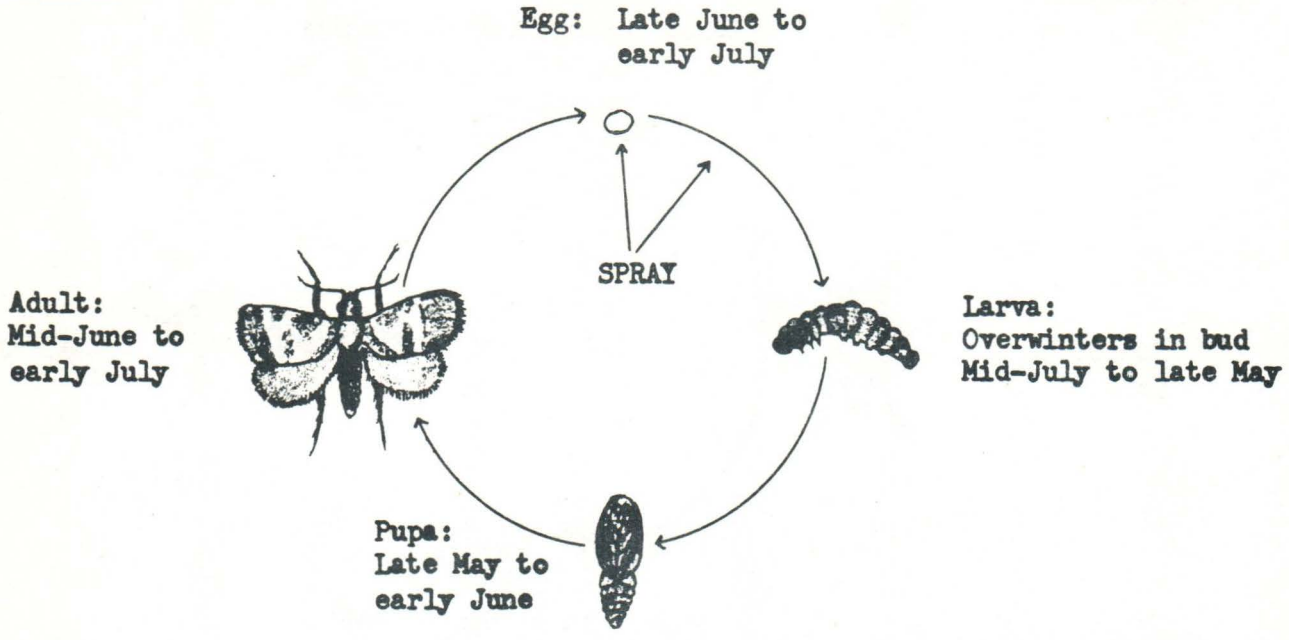
May 14, 1956 Printed by Michigan Department of Conservation

MICHIGAN FOREST PEST DETECTION PROGRAM*

INFORMATION SHEET NO. 3

EUROPEAN PINE SHOOT MOTH

Life Cycle:


Egg: Late June to early July
SPRAY
Adult: Mid-June to early July
Larva: Overwinters in bud Mid-July to late May
Pupa: Late May to early June

Hosts: Red and mugho pine preferred but will attack Scotch, jack, and white pines. Particularly serious in trees 2 to 8 feet tall.

Type of Injury: Kills buds and new shoots by feeding inside, resulting in the deforming of the trees, particularly those under 4 feet in height.

Description of Insect: Adults - mottled orange moth, 3/4 inch wingspread, forewings marked with irregular silvery crosslines, head and thorax light orange-yellow, and abdomen grey. Larva - brown with black head, 5/8 inch long when full grown. Pupa - brown, 1/2 inch long.

Control Measures: When moths are flying, about mid-June, spray trees to kill hatching larvae with 50% wettable DDT powder at the rate of 3# of DDT to 100 gallons of water. For smaller amounts use 3 level tablespoons of DDT to a gallon of water. Spray again 10 days later to kill late hatching larvae. Shaping and shearing Christmas trees in late June and July should help reduce the infestation. Aerial spraying - has not yet proven satisfactory for control of this insect.

Remarks: A serious plantation pest, found principally in south half and northwest part of the Lower Peninsula. Extremely difficult to control. Correct timing and thorough coverage with spray are imperative. Extensive control studies are currently being made by various research agencies.

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*COOPERATORS: Forest Industries, Michigan State University, University of Michigan, Lake States Forest Experiment Station, U. S. Forest Service, Michigan Department of Agriculture, Michigan Department of Conservation.

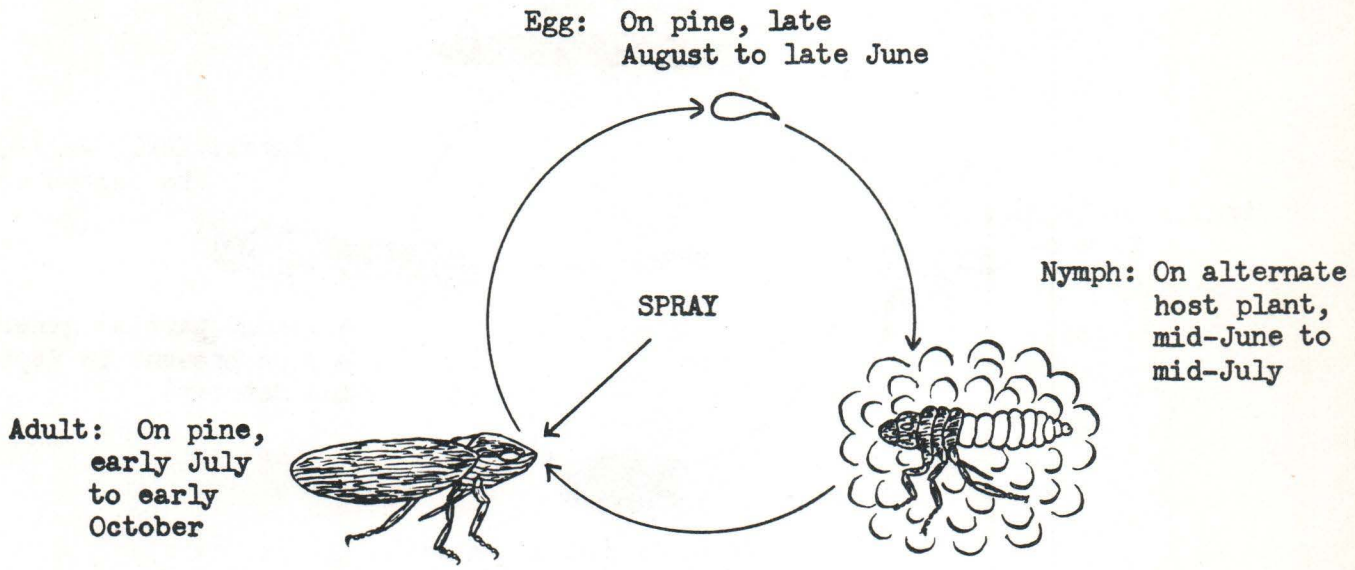
May 14, 1956 Printed by Michigan Department of Conservation

MICHIGAN FOREST PEST DETECTION PROGRAM*

INFORMATION SHEET NO. 4

SARATOGA SPITTLEBUG

Life Cycle:


Egg: On pine, late August to late June
Nymph: On alternate host plant, mid-June to mid-July
SPRAY
Adult: On pine, early July to early October

Hosts: Red and jack pine, 2 to 15 feet tall; alternate host, mainly sweet fern; also prairie willow, brambles, hawkweed, braken, and others.

Type of Injury: Adults feed on twigs and small branches by puncturing them and sucking juices. When enough punctures are made, twig is girdled and dies, turning needles brown. Whole tree may die from persistent attacks. Feeding punctures evident as brown pitch spots under bark.

Description of Insect: Nymph — black forepart, red abdomen, in masses of froth or spittle at base of alternate host at ground line. Adult — light brown, boat-shaped, 3/8 inch in length. Strong jumper when disturbed.

Control Measures: Spray during July when adults appear on pine, using 4 pounds of DDT 50% wettable powder in 100 gallons of water; or 4 tablespoons in one gallon of water. Aerial spraying with oil base DDT gives good control. Cultural control is aimed at shading out of alternate host plants by close spacing of trees which promotes early crown closure.

Remarks: A pest primarily in the Upper Peninsula and northern Lower Peninsula. Should not be confused with the pine spittlebug, common on jack, white and Scotch pines, the nymph of which produces spittle masses on the trees.

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*COOPERATORS: Forest Industries, Michigan State University, University of Michigan, Lake States Forest Experiment Station, U. S. Forest Service, Michigan Department of Agriculture, Michigan Department of Conservation

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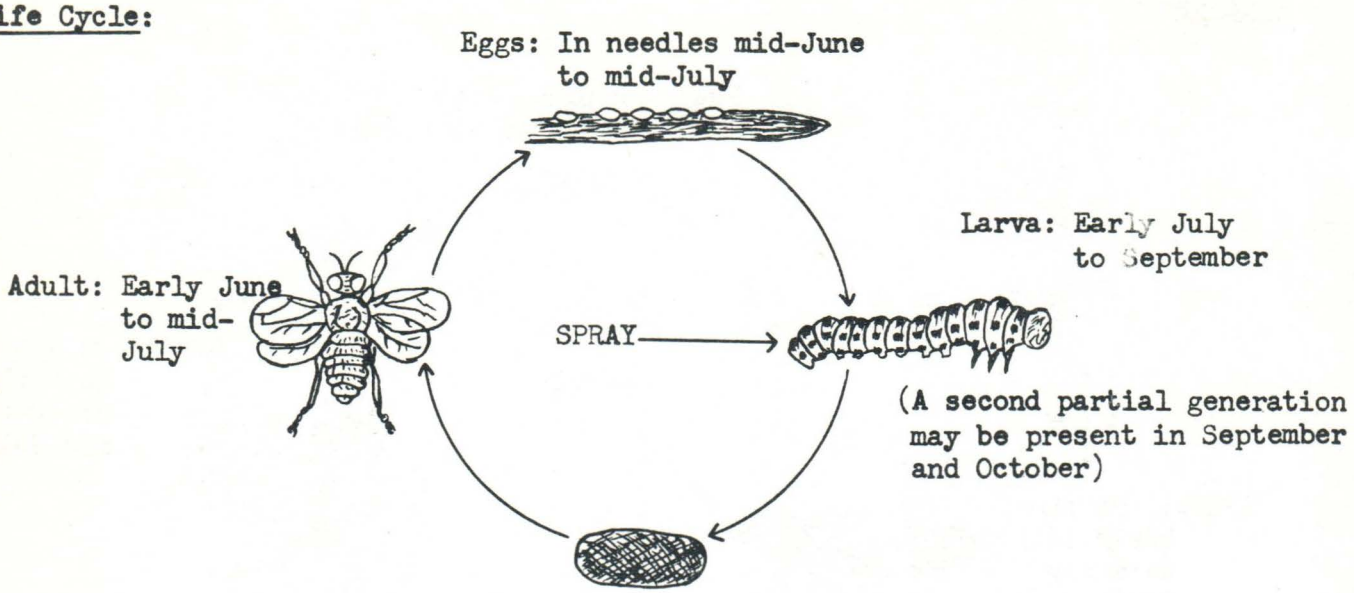
June 27, 1956 Printed by Michigan Department of Conservation

MICHIGAN FOREST PEST DETECTION PROGRAM*

INFORMATION SHEET NO. 5

RED-HEADED PINE SAWFLY

Life Cycle:


Eggs: In needles mid-June to mid-July
Larva: Early July to September
Adult: Early June to mid-July
SPRAY
(A second partial generation may be present in September and October)
Pupa: In cocoon in soil
Overwintering state
late August to early June

Hosts: Red, jack, Austrian and Scotch pines. Primarily a pest of trees 1 to 15 feet tall, and most abundant on trees in partial shade or along shaded borders.

Type of Injury: Larvae feed in clusters on new and old needles and may completely defoliate the tree. Early larval feeding causes needles to appear straw-like. Later all but needle base will be eaten. Heavy feeding produces an accumulation of small green-brown pellets under tree. One complete defoliation can kill a branch or tree. Prefers partial shade or shaded borders.

Description of Insect: Larva — 1 inch long when full grown, yellow with three rows of black dots on each side, orange-red head. Adult — 4-winged, fly-like insect, 1/3 inch long, rust colored, seldom seen.

Control Measures: When larvae appear, about mid-July, spray with 3 pounds of DDT 50% wettable powder or 3 pounds of lead arsenate in 100 gallons of water; or 3 tablespoons in one gallon of water. Aerial spraying with oil base DDT gives effective control. The smaller the larvae, the easier they are to kill.
Cultural Control: Avoid planting susceptible pines in the shade of hardwood trees or within 25 feet of hardwood borders.

Remarks: Found principally in the Upper Peninsula and northern Lower Peninsula.

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*COOPERATORS: Forest Industries, Michigan State University, University of Michigan, Lake States Forest Experiment Station, U. S. Forest Service, Michigan Department of Agriculture, Michigan Department of Conservation

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June 27, 1956 Printed by Michigan Department of Conservation

CONS. 4029
4/56

MICHIGAN FOREST PEST DETECTION PROGRAM - OBSERVATION REPORT

PEST _____ OBSERVER _____
(WRITE IN NAME IF KNOWN)

COL. 3-4. DAY _____
COL. 5-6. MONTH _____
COL. 7-8. YEAR _____
COL. 9-10-11. SAMPLE AREA NO. _____

COL. 12-13. DISTRICT _____
COL. 14-15. TOWN _____ N S
COL. 16-17. RANGE _____ E W
COL. 18-19. SECTION _____
COL. 20-21. FORTY _____

COL. 22. OWNERSHIP
_____ 1. FEDERAL
_____ 2. STATE
_____ 3. COM. OR SCH.
_____ 4. PRIVATE

COL. 23. ORIGIN
_____ 1. SEED
_____ 2. SPROUT
_____ 3. PLANTATION

COL. 24. FIRE RECORD
_____ 1. UNBURNED
_____ 2. CURRENT YEAR
_____ 3. PREVIOUS YEAR
_____ 4. PAST 2-5 YEARS
_____ 5. OLDER

COL. 25. CUTTING RECORD
_____ 1. NONE WITHIN 5 YRS.
_____ 2. CLEARCUT " " "
_____ 3. PARTIAL CUT " "
_____ 4. THINNED WITHIN 1 YR.
_____ 5. PRUNED WITHIN 5 YRS.

COL. 26. WINDFALL
_____ 1. NORMAL OR NONE
_____ 2. CURRENT YEAR
_____ 3. PREVIOUS YEAR
_____ 4. PAST 2-5 YEARS
_____ 5. OLDER

COL. 27. GRAZING RECORD
_____ 1. NONE
_____ 2. CURRENTLY
_____ 3. PAST 2-5 YEARS
_____ 4. OLDER

COL. 28. SOIL GROUPS
_____ 1. POROUS
_____ 2. NONPOROUS
_____ 3. ROCK OUTCROP
_____ 4. STAGNANT BOG
_____ 5. STAGNANT MARSH
_____ 6. SEEPAGE
_____ 7. FLOOD PLAIN

TREE SPECIES PRESENT IN ORDER OF ABUNDANCE		% OF STAND
COL. 29-30. A	_____	_____
COL. 31-32. B	_____	_____
COL. 33-34. C	_____	_____
COL. 35-36. D	_____	_____
COL. 37-38. E	_____	_____

COL. 39. % GROUND SHADED BY VEGETATION OVER 1 FOOT
_____ 1. 1-20
_____ 2. 21-40
_____ 3. 41-60
_____ 4. 61-80
_____ 5. 81-100

COL. 40. % GROUND SHADED BY TREES OVER 20' TALL
_____ 0. NONE
_____ 1. 1-20
_____ 2. 21-40
_____ 3. 41-60
_____ 4. 61-80
_____ 5. 81-100

COL. 41. ATTACK RECORD
_____ 1. STARTED THIS YR.
_____ 2. STARTED LAST YR.
_____ 3. STARTED EARLIER.
_____ 4. OLD ATTACK EVIDENT, NONE NOW.
_____ 5. NONE EVIDENT.

HOST OR HOSTS UNDER ATTACK
COL. 42-43. A _____
COL. 44-45. B _____
COL. 46-47. C _____
COL. 48-49. D _____
COL. 50-51. E _____

COL. 52. AVERAGE SIZE OF SUSCEPTIBLE TREES
_____ 1. UNDER 2 FT.
_____ 2. 2-6 FT.
_____ 3. 6-15 FT.
_____ 4. 15-30 FT.
_____ 5. 4-6 IN. DIAM.
_____ 6. 6-12 IN. DIAM.
_____ 7. 12-18 IN. DIAM.
_____ 8. OVER 18 IN. DIAM.

COL. 53. % ALTERNATE HOST ATTACKED
_____ 1. 1-10
_____ 2. 11-20
_____ 3. 21-40
_____ 4. 41-60
_____ 5. 61-80
_____ 6. 81-100

COL. 54. HOST HEALTH CLASSES
_____ 1. GOOD
_____ 2. MEDIUM (DEAD TWIGS, FOLIAGE FADED)
_____ 3. POOR (DEAD LIMBS, LEAVES SMALL)
_____ 4. DYING
_____ 5. DEAD

COL. 55. CONTROL OPERATIONS
_____ 1. NONE
_____ 2. LAST YEAR
_____ 3. THIS YEAR *
_____ 4. CONTEMPLATED

* GIVE DETAILS UNDER REMARKS

COL. 56. % SUSCEPTIBLE TREES ATTACKED
_____ 1. 0-1
_____ 2. 2-10
_____ 3. 11-20
_____ 4. 21-40
_____ 5. 41-60
_____ 6. 61-80
_____ 7. 81-100

COL. 57. STAGE OF PEST
_____ 1. EGG
_____ 2. LARVA OR NYMPH
_____ 3. PUPA
_____ 4. ADULT

COL. 58. DEGREE OF ATTACK

Bark Beetles
_____ 1. ONE ATTACK PER SQ. FT.
_____ 2. TWO ATTACKS PER SQ. FT.
_____ 3. THREE ATTACKS PER SQ. FT.
_____ 4. FOUR ATTACKS PER SQ. FT.
_____ 5. FIVE OR MORE ATTACKS PER SQ. FT.

Defoliation or Terminal Injury
_____ 1. 1-20%
_____ 2. 21-40%
_____ 3. 41-60%
_____ 4. 61-80%
_____ 5. 81-100%

COL. 59. SIMILAR STANDS IN AREA
_____ 1. PREDOMINANT
_____ 2. FREQUENT
_____ 3. SCATTERED
_____ 4. SCARCE

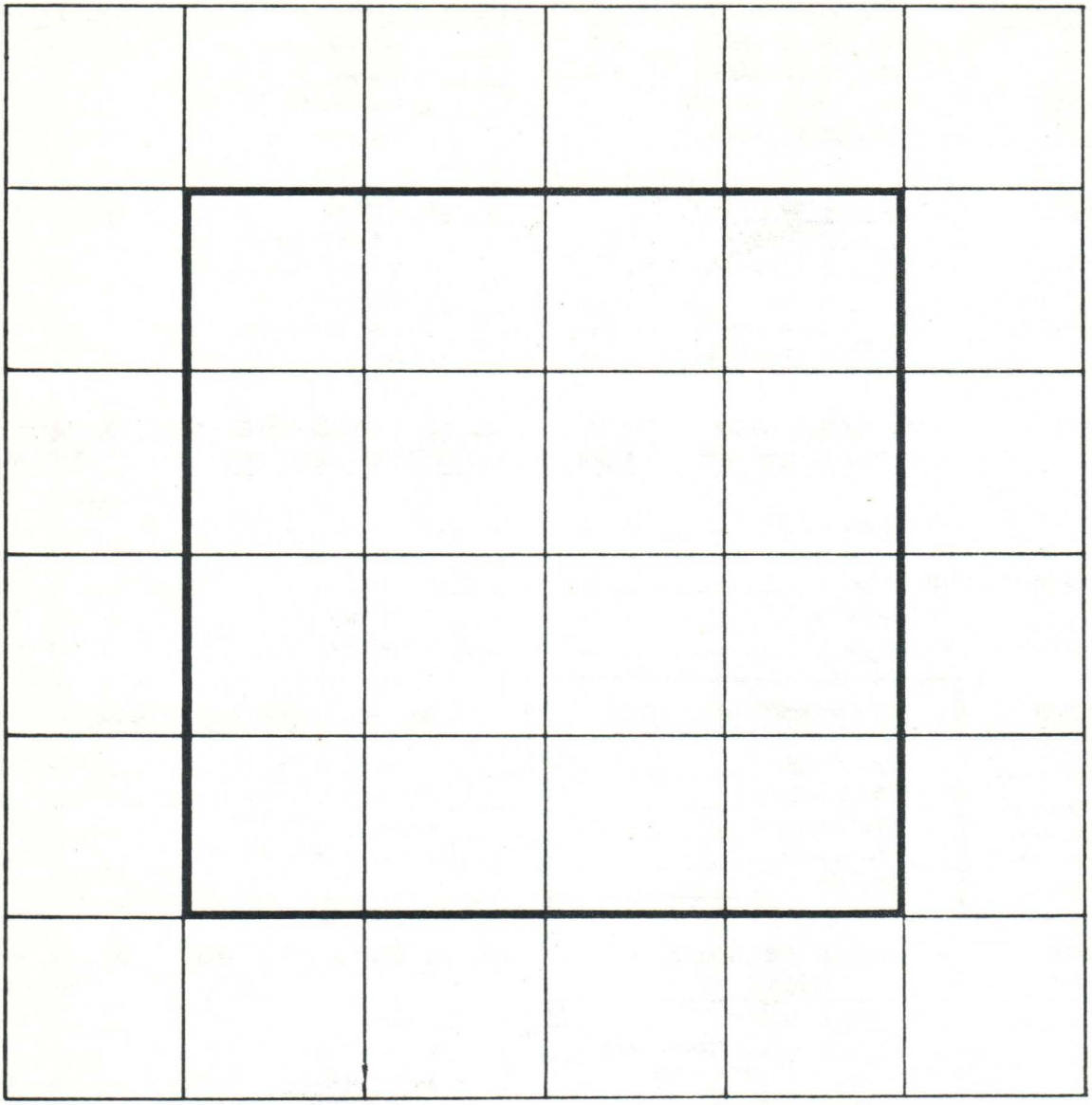
COL. 60. ABUNDANCE OF PEST IN SIMILAR STANDS
_____ 1. NONE
_____ 2. SAME
_____ 3. LIGHTER
_____ 4. HEAVIER

COL. 61. % TREE MORTALITY
_____ 0. NONE
_____ 1. 0-1
_____ 2. 2-10
_____ 3. 11-20
_____ 4. 21-40
_____ 5. 41-60
_____ 6. 61-80
_____ 7. 81-100

(Fill out back of sheet, and make sketch map to show local distribution if this can be determined. Also indicate under remarks any information which will give a more complete picture of the situation.)

NAME OF OWNER _____
(IF OTHER THAN STATE OR FEDERAL)

MAP SCALE _____ ESTIMATED ACREAGE OF INFESTATION _____



1. In your opinion, is the abundance of this insect increasing, decreasing, or the same as compared to last year on **THIS SAMPLE AREA**?

   Increasing _____ *Decreasing* _____ *Same* _____

2. What is the situation regarding the abundance of this insect as compared to last year on **YOUR ENTIRE DISTRICT OR OWNERSHIP**?

   Increasing _____ *Decreasing* _____ *Same* _____

3. **REMARKS:**